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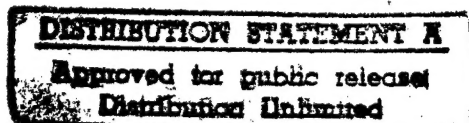
SELECTED ECONOMIC TRANSLATIONS

ON EASTERN EUROPE

(169th in the series)

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INTRODUCTION

This is a serial publication containing selected translations on all categories of economic subjects and on geography. This report contains translations on subjects listed in the table of contents below. The translations are arranged alphabetically by country.

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POLAND

Poland at the 27th International Fair in Barcelona

[This is a translation of an article by Andrzej Nalepa in Przegląd Mechaniczny, Vol XVII, No 19-20, 25 October 1959, Warsaw, pages 649-651; CSO: 3487-N]

In the period between the two world wars, Poland appeared only once on the list of participants at the Fair. This was during June 1936, the year in which the Spanish Civil War broke out.

After the Second World War, the first attempt to enter the Spanish market was made through the organization of a small information booth at the 25th Fair in Barcelona, in 1957, by the PIHZ [Polish Chamber of Foreign Trade]. However, this is not considered in official fair statistics as Polish participation.

Polish goods first appeared in Spain on a larger scale in 1958--in May at the Fair in Valencia and a month later in Barcelona. However, our machines were displayed in Valencia at the stands of our Spanish representatives and therefore, in a strict sense, there was actually no Polish stand. At the fair in Barcelona the case was entirely different. The Polish Pavilion was erected along "Palacio 2" at the Avenida Rius y Taulet. On the outside were displayed the machines of "Centrozap," "Metalexport," and "Motoimport." Display counters with specimens from various central trade offices were distributed along the walls inside the pavilion. The center space was occupied by the machine tools of the "Metalexport." The corners were used as office space.

The Polish stand, with a combined surface area of about 1,000 square meters, aroused considerable interest. Our achievements in trade as well as propaganda were great.

The display set-up of Polish goods at this year's 27th Fair in Barcelona was considerably changed. "The Polish Pavilion," of 540 square meters, was set up inside "Palacio 2." The interior was arranged in a manner which undoubtedly had considerable value; however, from the point of view of

propaganda and display of goods, I must consider it a total miss, for which the guild would have to be ascribed to unfortunately circumstances. A very considerable part of the surface area was assigned to office space for the particular trade centers; the display space consisted of a ring-like hall between the offices. The display items, small in size and drab in appearance--agricultural machines and machine parts were displayed in strongly illuminated individual showcases. There were almost no products of the folk-art industry, which could have enlivened the interior and introduced some elements of color. As a result, the interest of the fair guests was minimal.

At the Polish Pavilion outside of "Palacio 2" were displayed the machines of "Centrozap," "Motoimport," and "Electrim" over an area of about 180 square meters. This display was very effectively arranged and it aroused great interest among the visiting public (Figure 1).

Outside of the Polish stand, we also displayed all machines of "Metalexport" and some of the machines of "Motoimport", as well as small quantities of items representative of other trade centers, at the stands of particular Spanish firms that represent us.

The list of items displayed by the largest Polish trade centers--"Metalexport," "Centrozap," and "Motoimport"--was as follows:

I. "Metalexport"

a) Construction machines at stand of "Macmor" Co., Inc.:

Universal excavator KU-1001, manufactured by the Labedy Machine Shops

Universal excavator KU-503, manufactured by the L. Warynski Warsaw Plants for the Construction of Industrial Equipment

Portable crusher 4219, manufactured by the Pomorze Machine-Building Shops in Bydgoszcz.

Asphalt kettle KAP-1800 B, manufactured by the Highway Construction Machine Repair Shops in Wroclaw

b) Machine tools at the stand of the "Alvarez-Valls" Company, Inc.:

SPA-15 flat surface grinder, manufactured by the Mechanical Equipment Factory in Pabianice

SPA-1 flat surface grinder, manufactured by "Lucznik" in Radom

RVL-63 rotary lathe, manufactured by "H. Cegielski" in Poznan

MS-160 compression hammer, manufactured by the Forging Equipment Factory in Elblag

c) Machine tools on the stand of the "Gumersindo-Garcia" Company, Inc. (Figure 3):

BPU-7, a multiknived longitudinal automatic cutter, manufactured by the Metal Shops in Skarzysko

BPU-12, a multiknived longitudinal cutter, manufactured by the Automatic Lathe Factory in Bydgoszcz

ATL-40, an automatic, rotating cross-cutterl manufactured by "H. Cegielski" in Poznan

HSA-80 x 3000 longitudinal planer, manufactured by the Mechanical Equipment Factory in Poreba

d) Machine tools at the stand of the "Exclusivas y Suministros" Company, Inc.

TR 90 x 4000 universal lathe, manufactured by the Mechanical Equipment Factory in Poreba

TR 70 x 4000 (specifications as above)

TPC 24 high-spped production lathe, manufactured by the Andrychow Machine Factory

WRS 25 0.8 radial drill, with a table; manufactured by "H. Cegielski," in Poznan

WR 50 1.6 radial drill, manufactured by "H. Cegielski" in Poznan

CRA-710 hydrualic rip saw, manufactured by "H. Cegielski" in Poznan

II. "Centrozap"

Mining and metallurgical machines displayed at our own stand:

WLP-40 S pneumatic cutter

LZK 1 P air-driven loading machine; throws the material backwards

TND-32 belt conveyor

WLE-4G axle fan with a switch-off device

WLE-600 (specifications as above)

EKO-6 electric turnspit

KBP-6 pneumatic turnspit
NA--a machine to make molded masses
PAZD-39 self-propelled crane
Star 21 truck-mounted crane
Other smaller items at our own stand

III. "Motoimport"

Mechanized equipment displayed at our own stand and at the stands of other companies, such as "Corma," "Barrieros," and "M. Llompart":

"Ursus" wheel tractor, models C 451, C 325, and C 308
"Vistula" combine
"Mazur D-40" caterpillar tractor with a front plow
Star 21, with a high compression "Barreiros" engine
(Figure 4)
Other smaller items

Besides the three trade units mentioned, the following Polish trade units participated in the 27th Barcelona Fair: "Cekop," "Elektrim," "Rolimpex," and "Varimex."

It is impossible to give a full technical evaluation of the Polish machines and equipment displayed at this fair because of the lack of a proper time perspective as well as the great variety of objects displayed and the limited space for this article. However, some general observations can be made, which should be considered as personal view of the author.

To begin with, we must remember several fundamental facts which it seems to me should be known to everyone who is interested in foreign trade. This kind of fair is not an exhibition of prototypes, despite the illusory name, "Feria de Muestras" [Sample Fair]. At the Barcelona Fair brand name goods are exhibited that have been well tested, beautifully finished, and expertly made. One cannot send to the fair prototypes, untested models, and other more or less risky experiments, because if such things do not pass the test, the effect on foreign trade may be negative, since competition is very keen. In certain cases the importer may consciously buy goods that have certain flaws, if it pays him to do so. However, this cannot be a source of joy and pride to our export workers. The loss of a good name because of a [defective] machine is irrevocable and no improvements made later can dispell this first impression.

With respect to the machines displayed at the fairs in Valencia and Barcelona in 1958, the complaints of the importers, known to me, pertained to the driving chains of the KU-501 excavator and the WGH nut rolling machine, both manufactured in the Nowotki Shops in Warsaw. The problems connected with the production of chains are probably known to all those interested. The WGH-80 roller sold still contained some factory errors, which were minor but nevertheless fundamentally hampered its normal exploitation. The lack of spare parts made it impossible to remedy this completely, and the lack of design drawings made it impossible to make the spare parts on the spot.

It is still difficult to speak about the complaints concerning the machines exhibited this year at the Barcelona Fiar. However, I must ruefully admit that we may speak about the breakdowns of Polish machines. The KU-503 excavator broke down twice. The serious breakdown of the SPH-1 grinder during a demonstration organized for the customers caused many comments; the reason for the breakdown was the jamming of a pump that feeds the drive of the table. Besides that, the imported expressed reservations with respect to the construction as well as the finishing of the RVL-63 rotary lathe.

The remaining Polish machines may be considered, on the basis of their performance at the fair, to be made well--even very well. The particular praise of the importers went to the Ms-160 compression hammer and the KU-1001 universal excavator.

In private conversations with the Spanish importers, Mr. Garcia and Mr. Alvarez, I tried to get their opinion about Polish tool-making machines. Their opinion is generally in agreement with those of our technical circles: on the average, the machines may be considered good; however, great fluctuations in the quality of the goods made by the same factory considerably diminish the trust of the customers. The impression created by one faulty machine will not be erased even by tens and tens of good machines. I heard many bitter words about the workings of technical control in our shops. Further reservations were expressed with respect to the technical and functional design. There were complaints about the lack of servicing instructions or, if supplied, the fact that they were in Polish only; the disparity between the instruction texts and the actual construction of the machine; the lack of control test records or technical performance data, and so on.

Photo Captions

Figure 1. Machines of "Centrozap" and "Motoimport" on display at the Polish Pavilion

Figure 2. KU-1001 and KU-503 excavators at the stand of the "Macmor" Company.

Figure 3. Polish automatic machines at the stand of the "Gumersindo-Garcia" Company.

Figure 4. "Star 21" truck with a high-compression "Barreiros" engine at the "Barreiros" Plants stand.

POLAND

Wages in Construction (Interview with Director of
Employment, Wages, and Labor Safety)

[This is a translation of an article by Oskar Vieweger in Przegląd Budowlany, Vol XXXI, No 11, November 1959, Warsaw, pages 509-510; CSO: 3491-N/a]

First Question: Mr Director, last year a wage reform was undertaken in the construction and other industries. We are now witnessing serious excesses on the wage fund front without any economic justification, such as a proportional increase in labor productivity, improvement in the management of materials, etc.

We are interested in knowing whether and to what extent this wage reform has limited overpayments in the socialized construction-assembly enterprises.

Answer: The volume of overpayments must be explained first. A detailed analysis of the achievements of construction-assembly enterprises subordinate to the Ministry of Construction and Construction Materials (Ministerstwo Budownictwa i Przemysłu Materialow Budowlanych) on the volume of production, wage expenditures, and labor productivity shows that many indices rather improved during 1959. This is evidenced by the following figures:

In the first six months of 1959, the annual plan of production and services was 49.6 percent fulfilled, while 50.5 percent of the wages set aside for the entire year were expended. In relation to the semi-annual plan, the production and services plan was 109.2 percent fulfilled and the wage fund 107.3 percent. The total share of wages in the value of production and services amounted to 25.2 percent, while in 1958 it amounted to 25.8 percent and in 1957 to 25.6 percent. In absolute figures, during the first six months 233 million zlotys were expended above the plan, but the value of production and services exceed by 1,127 million zlotys the sum prescribed in the plan. It is true that the average wages of all workers during the first six months of 1959 rose by 12 percent in relation to the first six months of 1958, but the statistically measured productivity also increased

by 14 percent. However, the index of the total share of wages in the value of production and services deteriorated in the second quarter of 1959, rising from 23.2 percent in 1958 to 24 percent.

This was caused mainly by the fact that wage discipline deteriorated somewhat in the second quarter as compared with the same period of the preceding year. Thorough inspections conducted in May and June on the initiative of the ministry by the Supreme Auditing Chamber (Najwyższa Izba Kontroli) in scores of enterprises have shown that overpayments in enterprises under this department averaged 5.8 percent of all investigated payments.

It may be pointed out, for the sake of comparison, that similar inspections conducted in the second quarter of 1958 by the Chamber have shown an average amount of overpayments below 2 percent, and an investigation by the Investment Bank (Bank Inwestycyjny) in the third and fourth quarters showed approximately 5 percent in overpayments.

There were no such inspections in 1956-1957. Therefore, no criterion exists for direct comparison. But computations on the basis of an estimated increase in basic wages and an average rise in individual piecework rates on the one hand, and an estimated increase in labor productivity and average wages on the other, indicate that overpayments before the currency reform averaged approximately 50 percent in relation to the norms. A comparison of these figures clearly shows that overpayment decreased as a result of the wage reform.

Second Question: If the wage reform did not fully live up to expectations, what is the department going to do before the National Councils take over the state construction-assembly enterprises (on 1 April 1960?) to end, decrease, or at least hamper the mounting breaches of financial discipline in these establishments?

Answer: With reference to my answer to the first question, it should be stated that the wage reform played an important part in regulating the management of the enterprises but did not fully live up to expectations.

Such results as the substantial decrease in overpayments, as compared with 1956-1957, are inadequate. The reform was expected to eliminate the overpayments entirely, but this did not happen.

The phenomenon of the "long pencil" must be totally and generally liquidated.

Heeding the ministry's warnings, some enterprises and managements had already introduced suitable measures in previous years. During the first eight months of this year, 35 cases of discipline violation were reported to the prosecutor's office (such decisions were accompanied as a rule by an immediate dismissal of the guilty persons from work); for the same reason 12 employees were dischraged as a punitive measure, 51 employees were given notice, almost 100 were reprimanded, and nearly 1,000 lost their bonuses. As a result, the rise in the average wage has been slowed down since August, as the following figures show (workers in basic production, without separation dues):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
1,577	1,517	1,724	1,789	1,727	1,829	1,815	1,809

Conditions for further improvement were created in September and October: among other things, the labor force was reduced and numerous laggard workers and drunkards were fired.

As was proved, however, by the inspections, not all managements and enterprises took adequate measures to ensure full wage discipline. Thus, the activity of the Lodz Construction Board (Lodzki Zarzad Budownictwa) is considered adequate in this respect. Proper conclusions will be drawn, of course.

The Ministry of Construction also initiated the broadening of discipline control to embrace all state and cooperative construction enterprises, which will certainly contribute to the much needed improvement in the stability of the cadres.

In addition to regulations and instructions already issued and designed to strengthen wage discipline, the ministry is continuing and undertaking a series of long-range operations aimed at creating suitable conditions for the preservation of wage discipline and streamlining its supervision.

The essential problem is the creation of technical, organizational, and economic conditions under which earnings would rise not as a result of violating wage discipline but because of increases in labor productivity.

Aside from well-known measures for expanding technical progress, the ministry will undertake the following steps:

[a] Categorical orders will be issued not to expand the investment tasks beyond the available material resources and not to exert any pressure on the enterprises to accept such tasks, while, on the other hand, the rule must be adopted that only assignments which are provided with full blueprint and estimate documentation may be accepted and no subsequent changes are permissible.

[b] The construction assembly enterprises will be told to adhere strictly to instructions concerning an adequate supply of materials and reject all assignments lacking full documentation, or of which the execution is not assured by the available materials, equipment, and cadres.

[c] Construction work managers will receive further instructions spurring their efforts to improve work organization, create conditions for a maximum rise in labor productivity, dismiss immediately superfluous laborers and at the same time strongly resist all workers' demands for illegal wage increases.

[d] Party and union organizations will be asked to cooperate actively with the enterprises in resisting illegal wage demands.

Furthermore, work continues on adjusting the uniform catalogue of unit prices (CRA) to the technical work norms, while the factory and branch price lists will be corrected. Work will be speeded up on the new issue of the KSNK [not identified], which contains, among other things, realistic work norms.

Third Question: What is the wage situation in construction work in 1957-1959?

Answer: Some construction workers believe erroneously that wages in their industry are particularly low and that there is therefore an acute labor shortage, inability to meet targets, and other difficulties. Such an opinion is contradictory to the facts. In a large majority of the construction enterprises this year, the labor force exceeds the necessary requirements. This even led to inadequate increases in labor productivity and to cases of exceeding the wage fund.

It is also worthwhile to compare the average earnings of basic production workers in the month of June during the past

three years. They amounted to 1,468 zlotys in 1957, 1,613 zlotys in 1958, and 1,829 zlotys in 1959.

Thus, the average earnings increased by 24.5 percent within two years, and by 13.4 percent in the last year.

Consequently, current construction work wages are among the highest in our industry.

Fourth Question: There was much discussion in previous years among people active in construction, and articles also appeared in the technical and daily press, about the registration and control of costs in the construction area.

Some of these ideas, for example, the "Goebel-Gulewicz Method," published in our periodical, passed the test so successfully that construction work managers who adopted this method had no overpayments in their wage fund and liquidated the shortages in materials. But when after completion they were unable, for reasons beyond their control, to keep promises given to the crew and concerning the workers' share in the savings, the men moved to other constructions where wages and materials were administered by the "traditional method." It appears that even this flight of manpower may be taken as a proof of the usefulness of the experiment.

Would the department consider it profitable to introduce, as a broad experiment, one of these current registration and cost control methods (appropriate papers were taken over by the ministry from the former MBMiO [Ministerstwo Budownictwa Mieszkaniowego i Odbudowy; Ministry of Housing and Reconstruction] and the investors already received substantial financial rewards) for a period of one full budget year, in a specific part of the country (a wojewodztwo or at least several adjoining powiats)?

Answer: The demand for current registration and cost control in construction areas is justified. Work on this matter is already well advanced. The Institute of Construction Work Organization and Mechanization (Instytut Organizacji i Mechanizacji Budownictwa), in cooperation with several enterprises, worked out a comprehensive system of construction planning and controls, also utilizing some older drafts for this purpose. This system has been favorably appraised, in a preliminary way, by the interested enterprises, managements, and services of the ministry. Preparations are now in

progress to apply it experimentally in a few enterprises. This will take place in the first quarter of 1960, so as to make it possible in the second quarter to gather the initial results of the experiment, improve it, and gradually apply it more extensively. It should be mentioned that a basic condition for the introduction and effectiveness of such a system is its favorable acceptance and application by the production, construction, and works managers.

The technical press can help by publishing and explaining the principles of the system, pointing out the proper work methods and emphasizing the gains resulting from the current registration and cost control in the construction area.

POLAND

Employment and Vocational Training in Construction

[This is a translation of an article by Henryk Ruka in Przegląd Budowlany, Vol XXXI, No 11, November 1959, Warsaw, pages 521-525; CSO: 3491-N/b]

1. General Principles of the Training Plan in 1959-1965

The problem of preparing qualified new worker cadres for construction-assembly enterprises recently assumed great importance, because in 1960-1965 the enterprises should train approximately 163,000 new construction artisans who--in addition to the anticipated number of 83,000 basic vocational school graduates--are needed in order to fulfill the growing production plans.

In the past 15 years we have never been faced with such a big task in construction cadre training. Construction must mobilize all available means and set down the main course of progress in order to meet these targets.

The first consideration should be the size of the cadres required in construction and whether the planned number of approximately 246,000 qualified new workers for training is justified and will fully satisfy the needs of construction work.

The Ministry of Construction and Construction Materials Industry (Ministerstwo Budownictwa i Przemysłu Materialow Budowlanych) in the first quarter of this year made preliminary calculations concerning the anticipated employment in 1959-1965, in socialized and private construction enterprises. The results of these calculations are given in Table 1.

Estimates show that the anticipated increase in employment is out of proportion to the rise in construction production value. The value of this production will increase by 73 percent in 1965 in relation to 1958, while the total employment in construction (Items 2 and 3 in Table 1) will rise in 1965 by only 36.8 percent, or to 1,240,000 persons, excluding the "conservators" (konserwator) (Item 4 of the table).

Table 1

Specification	Total Employ- ment in Construc- tion, 1958	Anticipated Employment in 1,000's	
		1959	1960
1	2	3	4
1. Value of construction- assembly production, in million zlotys, in state, cooperative, and private enterprises	56,230	62,980	68,220
2. Number of workers employed in state, cooperative, SOWI*, and other enter- prises of the economic system--total	784.4	843.4	884.3
a) White collar employees	142.0	151.8	159.2
b) Workers	642.4	691.6	725.1
[c] Qualified workers	289.5	314.7	333.5
1) in construction- assembly work (deficit)	257.7	280.1	296.8
2) in other work	31.8	34.6	36.7
[d] Percentage of qualified workers in total labor force	45.0	45.5	40.0
3. Theoretical (probable) em- ployment of workers in pri- vate construction work			
[a] Total	122.0	135.5	148.4
[b] Full-time qualified workers	35.5	39.4	43.1
4. Estimated employment of "conservators" in construc- tion jobs, industry, public utilities, and apartment buildings	30.0	30.9	31.8

*[SOWI = Stowarzyszenie Odbudowy Wlasnosci Indywidualnej;
Association of Individual Property Reconstruction]

[table continued]

[Table 1 continued]

		Anticipated Employment in 1,000's			
	1961	1962	1963	1964	1965
1	5	6	7	8	9
1.	73,820	79,250	84,810	90,700	97,200
2.	913.9	946.3	976.5	1,006.3	1,036.4
2a.	164.5	170.3	175.8	181.1	186.6
2b.	749.4	776.0	800.7	825.2	849.8
2c.	352.2	372.5	392.3	412.6	433.4
2c1.	313.5	331.5	349.1	367.2	385.7
2c2.	38.7	41.0	43.2	45.4	47.7
2d.	47.0	48.0	49.0	50.0	51.0
3a.	170.0	174.9	183.2	192.1	203.9
3b.	49.5	50.9	53.3	55.8	59.3
4.	32.7	33.7	34.7	35.7	36.7

This disproportion, not accidental, between the rise in the value of construction-assembly production and the increase in employment results from the planned rise in labor productivity, which should increase in 1965 by 26.5 percent as compared with 1958. It is understandable that labor productivity will vary in different enterprises and also in the specific branches of the national economy. It may be quoted as an example that the anticipated rise in productivity in the six-year period is to amount to 7.4 percent in private construction but to 55 percent in enterprises under the Ministry of Construction and Construction Materials Industry, as compared with this year's productivity.

The estimated employment plan served as the basis for calculating the cadre requirements of construction work, the limits of which with regard to workers are given in Table 2.

These figures show that in 1960-1965 the absolute rise in employment will require the training in construction work of approximately 131,000 qualified new workers. This applies to such occupations as masons, carpenters, cement workers, plumbers, painters, oven makers, tinplate workers, roofers, cobblestone layers (brukarz), floor layers, electricians, hydraulic installators, assemblers of steel structures and industrial equipment, construction machine engineers, welders, and the new profession of assembling steel-concrete elements. This is not all: it is also necessary to prevent losses in cadres. Such losses, estimated at 5 percent of each year's previous employment, raise the needs of the construction

Table 2
A = Absolute rise in employment
B = Deficit

	1960		1961		1962		1963		1964		1965		1960-1965	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
1. Value of construction-assembly production, million zlotys	68220		73820		79250		84810		90700		97200		494600	
2. Employment* in state, cooperative, SOWI enterprises & other construction teams	33.5	34.6	24.3	36.3	20.6	37.5	24.7	38.8	21.5	40.0	26.6	41.3	158.2	228.5
3. Qualified workers employed in private construction	18.8	15.7	18.7	16.7	20.3	17.6	19.8	18.6	20.3	19.6	20.8	20.6	118.7	108.8
4. "Conservators" employed	16.7	14.0	16.7	14.9	18.0	15.7	17.6	16.6	18.4	17.5	18.5	17.4	105.6	96.4
5. Total employed in construction-assembly work (2a + 3 + 4)	37.9		41.7		39.3		40.8		42.5		43.9		266.1	

*in 1,000's
**in construction-assembly operations
***in other occupations
****in construction-assembly operations

industry in this field by an additional 115,000 qualified laborers. Calculations take into account such a relatively high percentage of losses because both the decrease in labor force due to natural causes and the flow of qualified workers from construction to other industries should be expressed in figures. This ebb is usually substantial when new industrial projects are under construction, where with the start of production a sizable number of construction workers are readily seeking employment.

Thus the construction industry will need a total of 246,000 qualified workers in 1960-1965 in basic construction-assembly jobs. The number of qualified workers mentioned at the outset as about to be trained therefore equals the number required in construction work.

The constructed requirements listed in the table under "other" occupations, totaling about 25,000 persons, are not taken into account in the training plan because they concern professions rarely met in construction work (turners, upholsterers, molders, modelers, etc.), but trained in adequate numbers in vocational schools under the Ministry of Education (Ministerstwo Oswiaty).

2. Two Basic Forms of Vocational Training

With the beginning of the 1959/60 school year, vocational training will be conducted in two basic forms.

The first will be the preparation of new cadres for construction by the basic vocational schools of the Ministry of Education. The number of graduates from these schools who have enlisted in construction work are so far inadequate. This year schools of this type, known as "schools of construction crafts" (Szkoly Rzemiosl Budowlanych), which train youth for construction exclusively, will furnish 1,000 graduates. Other basic vocational schools, particularly metal worker schools, are expected to deliver to construction presumably not more than 2,000 graduates.

Due recognition should be given to the efforts of the Ministry of Education to improve radically the training of cadres for construction. Considerable expansion of the construction crafts school network and last year's enrolment of more than 8,000 pupils in the first grade provide some assurance that the training plan in construction work will

be fulfilled. Table 3 illustrates the scope of this plan.

Table 3

		Graduates Planned (in 1,000's)					
		1960	1961	1962	1963	1964	1965 Total
Ministry of Education:							
Training in schools of construction crafts:							
a) in construction jobs (deficit)		2.0	5.0	6.0	7.0	8.0	9.0 37.0
Training in basic vocational schools							
b) in occupations*		6.5	7.0	7.5	8.0	8.5	9.0 46.5

*electricians, machine and equipment engineers, welders, and others

The planned enrolment in the first year in 1959/60, totaling about 11,000 pupils, probably represents the limit in the development of construction crafts schools, in view of the difficulties in obtaining more usable classroom space on premises administered by the Ministry of Education. Substantial investments will be needed to further expand the network of construction schools. The anticipated number of 9,000 construction crafts school graduates in 1965 will be obtainable if the 1962 first-year enrolment exceeds 15,000. Some 15 large new construction schools will have to be built to facilitate an increase in first-year enrolment by at least 4,000 pupils as compared with this year's plan. It should be remembered that these figures on graduates refer only to those who will do construction work. They do not include graduates who will continue their studies in the three-year technical schools.

The construction industry requirements concerning an adequate supply of graduates from other basic schools are easier to satisfy because they depend on a suitable adjustment of courses and on an enrolment increase in already existing schools. The Ministry of Education should, in my opinion, emphasize an increase in the number of trained electricians welders, machine and equipment engineers, and steel structure assemblers and should introduce a new specialization of "electric and combustion motor engineers," who would become the most suitable candidates for operating heavy construction and road equipment after a period of apprenticeship.

The second basic form for preparing new cadres for construction is the vocational training of adolescent and adult workers by construction-assembly enterprises. The training tasks of these enterprises are larger and more difficult than those facing the Ministry of Education. Although the training plan is divided among all economic departments and the cooperatives, its fulfillment would entail much effort on the part of the construction industry because of the large planned number of graduates. Table 4 concerns the plans in this field.

Table 4

	Graduates Planned [in 1,000's?]						
	1960	1961	1962	1963	1964	1965	Total
Training in factory schools:**							
Ministry of Construction							
a) in construction jobs	-	1.5	2.0	4.0	6.0	8.0	21.5
b) in construction jobs [sic]	13.6	10.1	9.0	7.1	5.9	3.5	49.0
Training within enterprises jointly:**							
WRN* local construction boards	2.8	2.7	2.6	2.4	2.3	2.2	15.0
Ministry of Communication	1.8	1.8	1.7	1.6	1.5	1.4	9.8
Ministry of Mining and Power	1.3	1.3	1.2	1.2	1.2	1.2	7.4
Ministry of Heavy Industry	0.9	0.9	0.8	0.8	0.7	0.7	4.8
Ministry of Communal Economy	3.0	3.4	3.1	3.0	3.0	3.2	18.7
Ministry of Agriculture	1.9	2.1	1.9	1.7	1.8	2.0	11.4
Social construction enterprises	3.2	3.0	3.0	3.0	2.9	2.8	17.9
Construction Work Cooperatives	1.0	1.2	1.2	1.2	1.2	1.2	7.0
Total	29.5	28.0	26.5	26.0	26.5	26.0	162.5

*[WRN = Wojewodzkie Rady Narodowe; Wojewodztwo National Councils]

**[Table in source does not make clear whether these items (which appear in a separate column) apply as interpreted here or jointly to all other entries.]

Vocational training of such a large number of workers in factory schools or within the enterprises is the more difficult, since factory schools in the construction industry are only now being organized, and training within the enterprises is being overhauled to conform with construction work requirements and with the Act of 2 July 1958, which deals with vocational training, adaptation to specific work, and factory employment conditions for adolescent workers.

Last year's program of the Ministry of Construction sets the following directions in the part dealing with the training of cadres:

[a] reorganization of vocational training within the enterprises in a degree ensuring the training of fully valuable qualified workers;

[b] organization of basic vocational factory schools for construction workers.

3. Vocational Training within the Enterprises

Training within the enterprises was begun in 1952 and continued without change until last year.

The core of this program was short-term training of the workers to perform tasks specified in the appropriate categories of the qualification lists. The preparation of a worker for a job, in accordance with the requirements of categories IV or V (of the old construction list), was defined as "teaching a vocation." Neither the training period--five to six months--nor its program met the indispensable requirements of achieving full vocational qualifications. It was rather a preliminary lesson or superficial grasping by the worker of his job.

Only by raising his qualifications could the worker obtain adequate information and knowledge within his selected vocation.

An excessive fragmentation of specializations and attempts to adapt the worker to the various categories of the list hampered the teaching in a given vocation and practically prevented the drafting of uniform, correct training programs. The variety of programs applied in specializations and the insufficient number of hours set aside for supplementary theoretical education adversely influenced the professional

qualifications of the construction craftsmen. Another factor contributing to this situation was the lack of effective pedagogic supervision and control of the teaching results, quite apart from minor organizational shortcomings.

However, despite its faults, this system had one important virtue: the possibility of a rapid and mass adaptation of unqualified workers to specific construction jobs, in numbers ensuring the fulfillment of the production plan in a given economic year.

This form of training, rather suitable in construction work, was strongly developed in 1954 and 1955 but rapidly declined in 1956-1958, as shown in Table 5. The data given in this table pertain to enterprises under the Ministry of Construction and Construction Materials Industry.

Table 5

Year	Workers Trained (in 1,000's)	Workers with Qualifications Raised (in 1,000's)	Total
1954	13.9	27.3	41.2
1955	22.2	33.6	55.8
1956	13.9	21.9	35.8
1957	13.3	9.3	22.6
1958	10.5	11.7	22.2

Therefore, new training principles had to be worked out to eliminate the faults and shortcomings of the present system and to ensure full effects without raising the costs substantially.

The change in principles regulating the period of vocational training has been made separately for adolescent and adult workers. The Minister of Construction issued a decree pertaining to adolescent workers, dated 5 January 1959 ("in the matter of employing adolescents for vocational training, adaptation to specific jobs, and apprenticeship," Monitor Polski, No 9, Item 34). Another decree is foreseen concerning adult workers lacking the required qualifications. The issuance of separate decrees was necessitated by the relatively big differences in training methods, resulting mainly from the obligation of including supplementary theoretical education for the adolescents and the limitations in their employment to certain kinds of labor.

The new principles adopt two basic forms of vocational training for workers:

[a] vocational education for the purpose of training qualified workers (having full theoretical knowledge and practical skill in a chosen vocation), lasting two to three years for adolescents and one to one and one-half years for adult workers;

[b] adaptation to specific jobs, to train for certain work, a range of work, certain operations, or a specific work position, lasting three to six months.

After completing vocational education or adaptation to a specific job, the worker should go through an apprenticeship lasting from three months to one year, during which he will acquire skill in his vocation. Certain types of work and vocations--often combining several hitherto separate specializations--have been specified, in which the enterprises can now train both adolescent and adult workers.

Until the ministry issues uniform programs for the entire country, programs worked out by the enterprises on the basis of detailed instructions given in the decree will certainly represent a step forward in regard to proper regulation of training within the enterprises. The department will issue, even before the end of this year, some uniform programs for the various vocations.

A novelty in program drafting is that the programs will now contain teaching material corresponding to the qualifications required of workers in the first category on the construction list, and that there will be only one program for each vocation. Qualifications will be raised in order to fill gaps in the training of a given worker and bring qualifications to the level required by the training program of a given vocation. The teaching period has been divided into two or three periods of vocational training (one-year periods for adolescents, six months for adults). After each period, the trainee will receive a certificate authorizing him to continue training in the next period, even if he changes his place of employment, but on condition that he stays in the same vocation. The adolescent is obliged during the training to take 18 hours per week of supplementary theoretical education, for which he receives the necessary leave from work; 200 to 300 hours per year of supplementary education are required of adult workers, the precise number of hours depending on the duration of the vocational training.

Vocational training will conclude in examinations, upon the successful passing of which the graduate will receive the title of qualified worker (craftsman).

The form of adaptation to specific work in construction should, in my opinion, be applied to a lesser extent than vocational education. This form is limited in principle to nontypical, infrequent, and easier kinds of work, not included in the vocational training programs.

Supervision over the training of adolescents is regulated by the decree of the Minister of Education of 14 February 1959, in the matter of supplementary education and control of the vocational training of adolescents employed in labor establishments (Dziennik Ustaw, No 17, Item 99), which in Article 4, Paragraph 23, specifies institutions and persons authorized to conduct the control and defines the extent of the control.

The department intends to solve the problem of pedagogic supervision over adult workers by utilizing the expanding network of its own factory schools. In addition to their main task of teaching and guiding adolescent workers, the staff of these schools will be duty bound to exert constant pedagogic supervision over the training of adult workers within the establishments. The schools will see to it that the standards in raising workers' qualifications within the factories is equal, or at least close, to the level of training conducted under the school system. This is an important matter, because in the period beginning in 1965 the enterprises under the department are to train 50,000 new workers in this way.

4. Factory Schools

Youth trained within the establishments on the basis of the new organizational principles will be able to achieve much better results than [they would] under the system in force up to now. It appears, however, that education in factory schools will be still more effective.

Basic vocational schools for working men--the so-called factory schools organized by the establishments--represent a higher form of cadre training than the internal factory schooling system. Teaching the pupils a suitable proportion (about 38 percent of the entire program) of theoretical know-

ledge, combined with practical training in selected construction projects, providing a well-qualified, experienced cadre of teachers and instructors, ensures the effectiveness of vocational schools of this type.

Youths accepted by the school have the following schedule: two days (18 hours) of theoretical lessons and four days (28 hours) of practical training on the construction site. Conditions for admission are a certificate of having completed at least five grades of elementary school and a directive from the place of employment. It may also be possible that pupils will be admitted directly to the school and later employed by the factory. However, the principle should be that pupils of the factory school must be employed at the same time by the factory for the specific purpose of learning the vocation.

In principle, courses in the school will last two years. For students without a seven-year elementary school certificate, courses may be extended for another year through organizing a preparatory class to supplement elementary education. During the study period the students are to receive a salary in accordance with regulations setting wage scales for adolescents. Out of town pupils are given lodgings in special workers' hostels, where they are assured of care and supervision by the school management. Graduates of the factory schools receive privileges identical with those of graduates of all other vocational schools.

The factory school will also be authorized to conduct supplementary courses to raise the qualifications of workers employed in the adjoining establishments. The aforementioned supervision by school authorities over the training within the factories helps to solve the last remaining difficulty in the field of vocational training. School principals are appointed by the heads of school districts, regardless of whether they have been accepted by the district offices or chosen (and paid for) by the enterprises.

Personal expenditures are paid for by the school districts, but other costs are covered by the enterprises from their own resources. Such costs will be inserted in the annual budgets within the technical-economic plans of the enterprise.

This limited description of factory school organization obviously does not exhaust the entire problem. The specific

purpose, scope of activity, duties, privileges, and other important aspects will be defined in detail by the statutes separately issued for each school by a special decree of the minister on the occasion of the school opening.

Factory schools will continue the good traditions of the old construction schools, known under the name of "State Centers for Vocational Training" (POSZ [Panstwowe Ośrodki Szkolenia Zawodowego]), liquidated or transformed in 1951 into other types of schools. It is worth mentioning that these schools are expected to educate over 20,000 valuable construction experts by 1965.

5. Tasks for Managements and Enterprises

The tasks of managements and construction-assembly enterprises in regard to vocational training are much higher this year than the planned targets of the previous year. The plan for training cadres calls for about the same number, but the changes in form and principles pose organizational difficulties much harder to solve than before. I have in mind the bigger tasks resulting from the obligation to organize factory schools. Financial means assigned for this entire educational scheme have been duly distributed. The execution of the training program therefore depends on the initiative and efficiency of the enterprises.

Some obstacles may arise in the organization of factory schools. The opening of a school requires a full review of conditions indispensable to its proper functioning. These conditions are suitable school buildings and, in most cases, appropriate premises for workers' hostels to accommodate the pupils, as well as school equipment and furniture, a qualified technical cadre able to teach and instruct, proximity of construction sites facilitating practical training, and the possibility of employing the pupils near the school for the purpose of acquiring practical skills.

It may be stated with satisfaction that a number of managements have adopted a favorable attitude toward the new trends in vocational training and have set up organizational committees. The work of these committees usually follows these lines:

- [1] working out a regional list of cadre requirements;
- [2] setting forth training needs for qualified workers,

while taking into account construction cadres educated in the basic vocational schools of the Ministry of Education;

[3] outlining a perspective plan for factory school development up to 1965;

[4] working out the details of the scholastic year for factory schools scheduled to commence teaching in 1959, their curricula, etc.

The work of many committees produces concrete results in the form of motions requesting the opening of schools or commencing their construction. A better method endeavors to save space for a school on factory premises or in buildings administered by the plant management. The example may be given of a committee set up at the Northeastern Construction Management, which is already organizing a school in Mrozy.

In spite of numerous difficulties facing the managements and the enterprises, it is hoped that they will now consider in a different light the problem of fulfilling the training plan set for this year.

The obligation, imposed by the department in accordance with the demands of construction work, of affecting basic changes in the present forms and principles of cadre training through successively rising demands in regard to professional qualifications of the workers and a strongly increasing demand for new qualified laborers permits the expectation that the enterprises will not get down to honest work.

POLAND

Construction Details of the Warsaw Metallurgical Plant

[This is a translation of an article by Wladyslaw Lenkiewicz and Jan Zarzycki in Przegląd Budowlany, Vol XXXI, No 9, September 1959, Warsaw, pages 421-428; CSO: 3492-N]

General Description of the Structure

Whereas some constructions are continuously spoken of and written about and are always mentioned in the daily and technical press columns, other are consistently omitted. Such an orphan is the Warsaw Metallurgical Plant. Almost nothing has been written about it outside of relatively few mentions in the daily press. This silence is completely unjustifiable, even disregarding the significance of this plant for our industry. The construction in itself is interesting and worth several articles, if only as an example of a rational and well equipped construction site.

The virtue of the plant constructors in this case is their choice of equipment in the proper assortment and needed quantities, because the full supply of equipment is undoubtedly the result of the priority the plant is given owing to its considerable significance for our industry.

The Warsaw Metallurgical Plant will produce high-grade steels such as molybdenum steel, nickel-molybdenum steel, vanadium-molybdenum steels, and the like. The production of the plant will not only cover our own needs of the precision instrument, machine, and shipbuilding industries but will also produce for export.

The plant production is based on molten iron from Martin and electric furnaces. The technical estimates of the plant foresee the production of fine steel ingots and also rolling and forging processes, which will give a wide assortment of supplies, running from girders to thin steel sheets. This kind of production makes it necessary to construct several divisions. We therefore have in the Warsaw Metallurgical Plant:

- a) a steel foundry which will produce about 5,000 tons per year of all kinds of steel castings;
- b) a steel mill which will deliver over 300,000 tons per year of fine steel;
- c) a steel rolling mill which will produce a wide variety of rolled products;
- d) a steel wire-drawing mill which will produce all kinds of wires and drawn products;
- d) a forging plant.

The size and the product assortment makes the Warsaw Metallurgical Plant one of the leading plants of its kind in Poland.

Besides the production divisions, the plant will contain considerably expanded service divisions, such as gas-producing facilities that supply gas for the Martin furnaces, as well as a team of special service facilities which have as their goal the conservation of the plant equipment, to assure its [continuous] production and to care for a crew of more than 5,000 men.

The size of the plant is attested to by the fact that it occupies 180 hectares and that the construction facilities alone occupy 32 hectares. The total building space of the plant will be almost 3 million cubic meters, of which half will be allotted to the rolling mill.

The area of the plant will be served by 10.5 kilometers of vehicular roads, 81 kilometers of telephone and signaling network, 48.5 kilometers of water supply lines, 8 kilometers of c-o [carbon monoxide pipelines] and 7.5 kilometers of sewer pipes, of which two kilometers are storm sewers. Besides this, there are purely industrial installations, such as one for compressed air with 3.5 kilometers of pipes, gas, steam, oxygen, and similar installations.

The plant was started in 1952 with the preparation of the construction site. Half of the total volume of buildings will be completed at the end of the current year. It is mainly the rolling mill that remains to be constructed. The installation of industrial equipment goes on simultaneously with the construction work; this allowed us to start production before the construction work was completed.

The Construction of the Units

The basic production units are made of welded steel construction (Figure 1).

The smaller or auxiliary production units are of mixed steel and reinforced concrete construction (Figure 2).

As a rule, the reinforced concrete pillars are covered with steel beam roof supports. The walks and raised walks are mainly of reinforced concrete. A series of auxiliary units were also made of reinforced concrete. The majority of reinforced concrete structures are made of prefabricates; even such a complicated unit as a gas-producing plant is made of prefabricates (Figure 3).

However, there is no lack of monolithic reinforced concrete structures, built sometimes with a certain architectural flair, as shown in Figure 4--a tower cooler erected on a graceful steel frame. Combined methods of monolithic and prefabrication are also used--for example, the covering of a reinforced poured concrete skeleton with prefabricated steel-cable concrete support beams (Figure 5).

As may be seen from the attached photographs, modern but tried construction systems were used based on a 6-meter norm. The basic units are predominantly two- or three-nave halls equipped with overhead movable cranes. As auxiliary units, single-nave halls were used, also equipped with overhead movable cranes. The foundation anchors for the hall pillars are made exclusively from poured concrete. In cases where prefabricated reinforced concrete pillars were used, they usually had special cups for anchoring the pillars. The steel or reinforced concrete roof supports are covered with plates that have a light concrete coat and are in turn covered with roofing tarpaper. The walls of the halls are made of silicate bricks or concrete slabs. Steel window frames are used everywhere, and the majority of gates are of steel too.

We purchased the preliminary design of the metallurgical plant as well as the technical designs of the basic production units from the Soviet Union.

The remaining designs were worked out by our domestic design offices, mainly by the Design Office of the Warsaw

Metallurgical Plant. On the basis of Soviet designs, we were able to start construction quickly, since we were relieved of the chore of checking the design estimates.

Construction Details

The adaptation of the design has created a number of ingenious solutions, for which we must give credit to the builders of the Warsaw Metallurgical Plant. We could fill an entire article with descriptions of these solutions; here we will discuss only the most interesting ones. The lack of bricklayers has forced the builders of the plant to replace brick walls with prefabricated slabs (Figure 6).

These slabs are made in the form of reinforced concrete panels immediately finished from the outside. These panels are fastened to the reinforced concrete pillars by welding the joiners that are cemented into the panel to the angular extensions of the pillars. The panels are fastened to steel pillars through a very ingenious catching device (Figure 7).

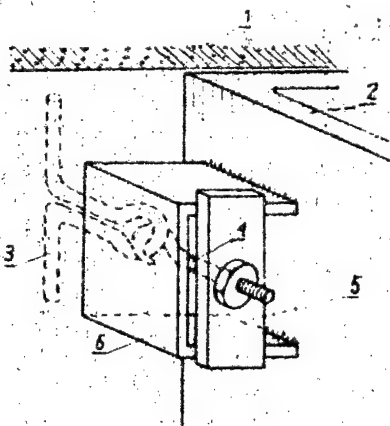


Figure 7. A Method of Attaching Reinforced Concrete Wall Panels to a Steel Structure

- 1) the panel
- 2) steel pillar
- 3) the catch cemented into the panel
- 4) the hook with a threaded end
- 5) washer
- 6) the frame that is welded to the pillar

This kind of catch allows great leeway in spacing the catches; it reduces the installation of the catches to a simple operation and permits very precise control over the placing of the panels.

In cold buildings, the walls were made of asbestos-cement corrugated panels (Figure 8), which are attached to steel bars. This method, frequently used abroad, reduces the load on the building skeleton and also the consumption of materials.

Monolithic reinforced structures are rare in the area of the plant. Buildings made from prefabricates that are generally joined through welding steel extensions are in the majority. However, other methods of joining are also used, such as joining through a bar that grasps the pillar of the building skeleton (Figure 9).

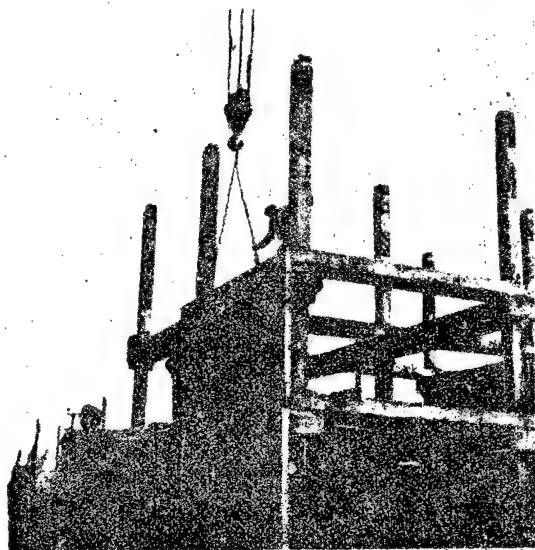


Figure 9. The erection of the building that houses the cooling fans. We see in the picture the method of joining the bars to the pillars. The crossbars are lowered along the pillars until they rest on the wedges. After they are straightened out, the grasping rings are filled with concrete and the vertical bars are then put in place in the same manner, except that they rest on the crossbars. At the top of the pillars we notice the grooving that serves for joining with the upper bars as well as with the roof support units. The wall panel

is fastened at the bottom to vertical extensions that protrude from the lower panel and at the top through welding to the bar.

In order to increase the adhesiveness of the concrete that fills the grasping ring to the elements that are being joined, the pillar surface at the contact points and the interior of the ring are grooved.

The Work Organization

An enterprise especially created for building the metallurgical plant is the general contractor. Besides the PBHW [Enterprise for the Construction of the Warsaw Metallurgical Plant], "Mostostal" also participates in erecting the buildings. They erect the steel structure, although some of these structures are also being erected by the PBHW. Numerous specialized enterprises work on this construction site, such as "Energomontaz-Polnoc," Enterprise for the Construction of Industrial Furnaces, Enterprise for Industrial Installations,

Warsaw Association for Electrical Installations, "Metrobudowa" Enterprise for Engineering Jobs, and 13 smaller specialized enterprises--in other words, a total of 20 enterprises.

The erection of the steel framework is carried out by "Mostostal" by a consecutive erection system. The heavy units are put up by self-propelled crane of the "Fiorentini" type (Figure 10_ with a lifting capacity of 50 tons.

The lighter elements are erected by a tower crane of the "Wolf" type that has a maximum lifting capacity of 6 tons and a boom reach of up to 20 meters. The erection work is carried out by groups of seven to ten men and the crane operating crew.

The method of shortening the aging period by the aid of steam is used throughout. The steam is supplied by mobile units or portable steam generators that can be put up at the various levels (on temporary stands). The steaming is done with live steam injected underneath tarpaulins.

Pillars weighing 7 to 14 tons were erected either by a railroad crane, which could easily be maneuvered thanks to the extensive network of rail spurs, or by the E-1003 universal excavator. Lighter units were put up by the SBK-1 type of tower crane. After the erection the crane served to bring materials to the bricklayers who were raising the walls, or to the roofers who were putting the smooth coating on the roof panels of the hall.

The erection work was also done by the consecutive system, in groups of five to seven concrete workers. The erection of each framework was carefully prepared from the organizational point of view. The plan of work organization was always worked out. For the first 20 units, such plans were prepared by the Faculty of Organization and Mechanization of Construction under Prof Dr A. Dyzewski of the Warsaw Polytechnic. The plan contained, besides an exhaustive technical description, a list of elements (Table 1) and diagrams on how to carry out the erection (Figure 11). Since, as we said above, the heavy units were made at the construction sites, they were therefore manufactured on a spot from which they could be put up directly. Thus the erection plan also contained a diagram for the placement of the production stands (Figure 12).

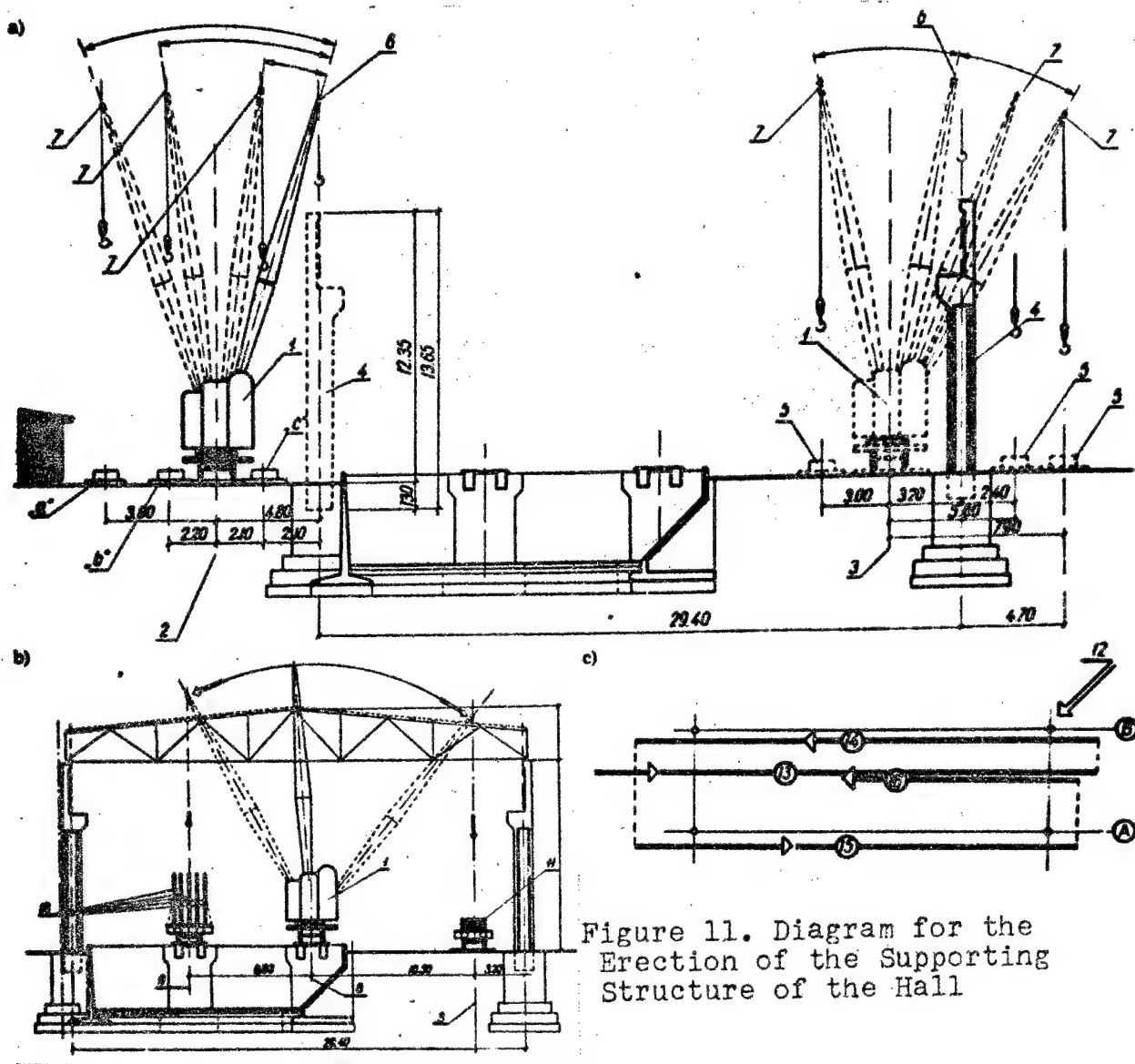


Figure 11. Diagram for the Erection of the Supporting Structure of the Hall

- a) Erection of wall structures
- b) Erection of the roof structure
- c) Work plan for the railroad crane

1) railroad crane Q-45 Tm; 2) axis of temporary track; 3) axis of track No 5; 4) pillar; 5) stands where the pillars were made; 6) extensions for attaching the pillar; 7) extensions for putting up the pillar; 8) axis of track No 6; 9) axis of track No 7; 10) a railroad car with roof support beams; 11) a railroad car with roof panels; 12) starting of the crane; 13) laying of crossbeams on track No 7; 14) positioning of units on axis B; 15) positioning of units on axis A; 16) erection of the roof structure.

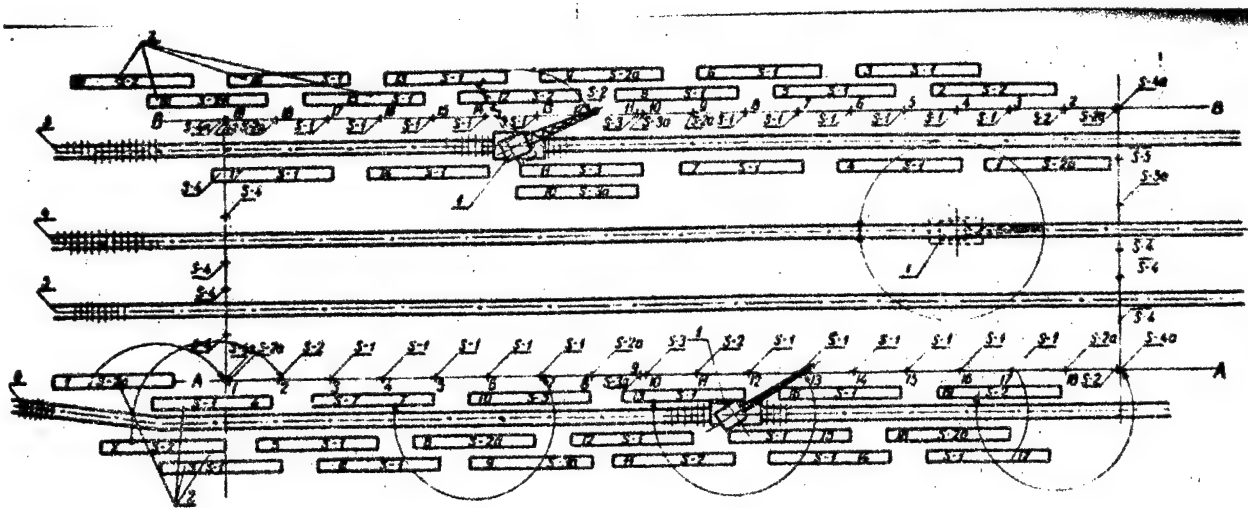


Figure 12. Plan for Spacing the Pillars

- 1) crane
- 2) pillars on the stands
- 3) axis of track No 5
- 4) axis of track No 6
- 5) axis of track

Table 1

	1	2	3
4	Rygle scian podfurmych	R ₁	2
		R ₂	2
		R ₃	1
		R ₄	2
		R ₅	2
		R ₆	4
		R ₇	4
		R ₈	8
		R ₉	4
		R ₁₀	4
5	Rygle scian podfurmych	R ₁₁	4
		R ₁₂	26
		R ₁₃	4
		R ₁₄	25
		R ₁₅	4
		R ₁₆	8
		R ₁₇	26
		R ₁₈	4
		R ₁₉	1
		R ₂₀	10
6	Stopy sc. sztyt	S-1	22
		S-2	6
		S-2a	6
		S-3	2
		S-3a	2
		S-4	8
7	Stopy sc. podfurmych	S-4a	4
		S-5	1
		S-5a	1
		S-6	100
8	Pn 1	Pn 1	334
		Pn 2	6
9	Wzrosty dach	19	~16

- 1) name of unit
- 2) quantity
- 3) weight per unit in tons
- 4) longitudinal wall bars
- 5) longitudinal wall bars
- 6) wall topping pillars
- 7) longitudinal wall pillars
- 8) panels
- 9) roof beam girders

The attached erection diagrams pertain to the hall shown in Figure 2. This erection was a typical one; since a score of other units were put up by the same method, we will describe it in greater detail. The erection of the hall included laying the track-supporting beams, putting up the pillars and bars, and erecting the steel structure and roof and filling them with slab panels. The track-supporting beams of track No 6 were made on floors laid out along the wall of the building marked by axis B (see Figure 11a) and those of track No 7 along track No 5. The spacing of the pillar production stands is given in Figure 12. The bars were made in the plant of the enterprise.

The beams of track No 6 were put down by an E-1003 crane and those of No 7 by a railroad crane traveling on track No 5. The crane starts the construction of the building supporting structure from the same track. With the great lifting capacity of the crane, it was possible for the pillars to be raised vertically and put into the foundation container. The temporary fastening and straightening of the pillars was carried out with wood wedges. The pillars of the wall marked A could not be put up from track 7, since it was too far from the wall of the building. Therefore, a temporary additional track was laid outside the building and the pillars were put up from there, as for wall B. The inside beams and bars were erected from the same tracks. The crane simply picked them up directly from the railroad cars in which they came from the concrete plant.

After the bars are welded to the pillars, the railroad crane from track 6 erects the roof-supporting steel beams that were delivered by railroad car on track 7. They are joined with anti-wind tension cables as they are being put up. A scaffolding is suspended from the building top, as in Figure 2, to make possible the connection of the anti-wind cables to the roof-supporting beams. The last job of the crane is to deliver the roof covering panels. The crane still moves on track No 6, but the slab panels are delivered by railroad car on track No 5.

Besides this kind of typical construction, there were many units that required individual solutions, for example, the base of the gas reservoir (Figure 13).

After the base was put up, it was reinforced and tightened by cables which run over two fields of the reservoir circumference. The entire circumference is divided into eight fields (Figure 14).

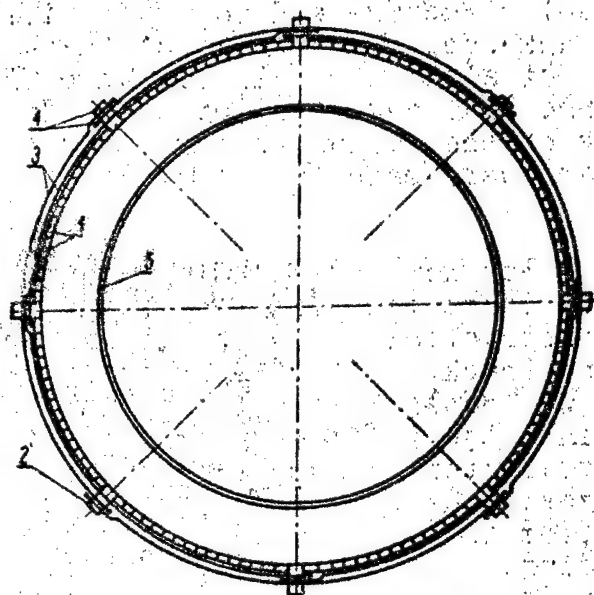


Figure 14. Diagram of the Cable Tightening Attachments

- 1) elements of the external wall
- 2) resistance
- 3) cables
- 4) concrete cones for anchoring
- 5) internal wall

The diameter of the reservoir is 42.06 meters. The base was made as follows: first a ring-like foundation for the support of the reservoir walls was cemented into the excavation. After insulating the upper foundation plate, the internal wall, composed of 72 grooved units weighing 1.8 tons each, was put up (Figure 15).

The erection work was carried out with an E-1003 universal excavator, after which the same crane put up 128 elements of the external wall. During the erection the elements were supported by wooden beams, visible in the photograph. They were straightened by driving wooden wedges between the elements. Such wedges may be seen in Figure 16 in the internal wall. After the wedge was driven in, screws were attached in holes made especially at the top of the side walls. After the positions of the elements had been established, the joint seams of the elements were filled with concrete. Special boards were used for boarding up the seams, which permitted de-aeration of the concrete. The de-aeration was carried out under the supervision of the Faculty for Reinforced Concrete Construction of the Krakow Polytechnic, under the direction of Prof Dr B. Kopycinski. After the concrete was hardened, the cables were tightened and covered with concrete. The final step was the cementing in of the

flexible plate and testing the tightness of the reservoir. The elements of the reservoir were made in the concrete plant of the enterprise and delivered by tractor trailer. The construction proceeded from the trailer. The job management worked out the construction organization plan. Making the reservoir base from prefabricates resulted in considerable savings in concrete and particularly in wood. This saving is estimated as 800,000 zlotys.

The carbon monoxide reservoirs are also among the more interesting construction solutions. Their shape is similar to that of reservoirs of fired clay in Jaroszw, but they are composed of four trapeze-shaped plats instead of rings.

Although there are considerable reservations about the design of such reservoirs made of reinforced concrete, nevertheless the solution of this construction was ingenious. Reinforced concrete reservoirs are heavy, difficult to erect, or require great quantities of lumber if constructed as monolithic structures. The savings in steel are quire illusory, as can be seen in Figure 16.

The carbon monoxide reservoirs were erected by means of the "Marion" crane because of the heavy weight of the units and the high lifting distance. The erection of the reservoirs was begun after a prefabricated framework was put up. In order to hold the units in place, special clamps were attached at the joints where the upper bars met the corner pillars; metal sheets cemented into the units were held fast by these clamps with the aid of screws (Figure 17a). From the bottom, the units were held fast by hooks (Figure 17b) suspended on double-T steel beams, which in turn were supported on beams (Figure 17c).

The reservoir was erected as follows: first the upper clamps were put up and two opposite units were suspended from them. Then double-T steel beams were put up above them and the suspended units were raised by a crane to an inclined position and attached to the lower hooks. Next, the remaining two units were lowered, directly suspended on an incline from the hook of the crane. After the units were positioned, the units were welded to each other and to the bars (Figure 18).

The structure housing the reservoirs was built by "Mostostal." The construction method did not deviate from that used for multistory structures made of prefabricates. Attention

may be called to a few details. For example, the ceiling slabs were cemented in without clamps and were tied up by a noose which held the slab almost in the center (Figure 19).

The slab was raised in an inclined position. While being lowered, the lower edge of the slab rested on a support welded to the pillar; the slab was then turned and put in place. This method eliminates the cutting of the clamps, but there is a danger that the slab may slide out from the noose during lifting. Expansion-contraction devices with circumferences adjusted to the pillar dimensions were used to adjust the pillar positions (Figure 20).

Unfortunately, negative features were not lacking on this construction site. It was characterized by a disregard for the industrial safety and hygiene rules. This is evident even in the attached photographs. The construction workers step onto a slab that still hangs on the hook of the crane. The lookout in Figures 20b and 21 has no barrier. We should be glad that construction work carried out in this manner did not cost us human lives.

It is also worthwhile to mention that the difficult ground conditions are a serious hindrance in this construction. Up to 2.5 meters deep, the construction ground consists of fine-grained sand that in some places shows admixtures of gravel and clay. Below that are layers of sandy clay, clayey sands, or compressed silt. These layers create many water pools. The layer formation is heavily folded and irregular. The pool formation facilitates a high water table, which appears at a depth of 0.8 to 2.6 meters.

Such ground conditions made the foundation work extremely difficult. The first jobs even required the use of water-tight walls. The sewer network has now lowered the water table so that difficulties are still encountered only in digging deep foundations for machines and installations. The deep foundations require special drainage of the land or even permanent drainage installations which empty into the sewer system. The foundation works not only devour great quantities of concrete, lumber, and steel but also compel us to retain a sizable crew of surveyors.

The basic surveying is done by the geodetic service of the investor, which stakes out the buildings. The surveying control of finished jobs is carried out by geodesists of the Warsaw District Surveying Enterprise.

That the surveying jobs are not simple can be surmised from the attached photographs of the not yet most complicated foundations (Figure 21).

On this construction site one may encounter, besides the erection of prefabricates and jobs done by traditional methods, almost all methods used in reinforced concrete work. Many units were constructed by using sliding boardings (Figure 4) or by transference boardings (Figure 22).

Construction Inventory

The inventory of the PBHW consists of administrative buildings and buildings for social functions as well as a large number of production shops.

The most important shop is the one that provides prefabricates for the entire construction site, exclusive of the reinforced concrete roof-supporting beams. The production in the shop is organized on open air stands equipped with molding tables (Figure 23).

The molded unit is transferred by a crane conveyor of 9 meter expansion and a 3-ton load capacity to the aging area, where the molding is removed, except for the base (Figure 24).

Units produced in small quantities are made in wooden molds, as the photograph shows. Mass produced units have steel molds. The prefabricates made by the shop are generally typical ones. Only the roof panels are produced in double width--that is, they are 3 x 6 meters. This reduces the number of joining seams that have to be cemented on the roof and permits better utilization of the heavy construction cranes.

A central concrete production plant capable of producing 200 cubic meters of concrete per shift supplies concrete to the construction site and to the prefabricate shop. The concrete plant uses mainly cement delivered in bulk from Zeran.

All the 250 grade cement used on the construction site comes from this source.

The cement is transferred by a pneumatic conveyor directly from the trucks to storage bins on the highest floor of the factory.

The reinforcing frames are supplied by a plant that is capable of producing 110 tons per month. This plant is fully equipped, including heaters and welding apparatuses, so that all prefabricate frames are heat-prestressed or welded.

The inventory also includes a carpentry shop capable of processing 90 cubic meters of lumber per month as well as a machine shop capable of processing 100 tons of steel per month. These two shops are also well equipped with machines.

The equipment stock, means of transport, and material supplies are also important components of the inventory.

The size of the inventory is indicated not only by the area that it occupies but also by the fact that it has 5 kilometers of road. The entire inventory area is equipped with heat, power, water, sewers, and a telephone and public address system.

General Remarks

Such a large, interesting, and well-equipped construction site is not only a mine of technical experience but it could also become a gauge for determining the production costs of all kinds of units--typical as well as rare--such as the so-called "Kafar" (Figure 25).

Unfortunately, this goal cannot be reached under the accounting conditions prescribed for construction enterprises, and the entire work of the expanded accounting system is not properly utilized. Under the present system of bookkeeping, there are great doubts as to the accuracy of the results entered on the calculation sheets. We are therefore unable to give any reliable cost coefficients.

This matter should be straightened out because, in our attempts to conduct a rational management, it is imperative to have a real basis for planning production costs and for controlling the investment returns on constructions.

Photo Captions

- Figure 1. The steel mill halls during construction.
- Figure 2. A storage hall for granular materials during the erection of the roof supports. In the background we see a steam-powered railway crane lifting a steel frame structure. In the foreground the storage bins are visible.
- Figure 3. The skeleton of the gas-producing building with the storage tanks visible. The entire unit is made of reinforced concrete prefabricates joined together by means of welded steel protruberances.
- Figure 4. Tower cooler made of monolithic reinforced concrete, using a sliding lumber mold pattern.
- Figure 6. A wall of the rolling and pressing mill hall. The steel skeleton is filled in with prefabricated reinforced concrete slabs.
- Figure 8. The interior of the hall for the repair of the pouring kettles. To the reinforced concrete pillars are attached steel bars that support the asbestos-cement corrugated panels.
- Figure 10. The "Fiorentini" crane during the erection of the steel framework for the steel mill of the plant.
- Figure 13. General view of the gas reservoir base during reinforcement.
- Figure 15. Putting up the outside wall elements of the gas reservoir base.
- Figure 16. The structure skeleton of a reservoir unit for carbon monoxide storage. A dense network of circular bars was put up, besides the framework and the rectangular supports.
- Figure 17. Suspension of the units of the carbon monoxide reservoir: a) corner clamps; b) hooks that hold the plates from the bottom; c) the beams that support the hooks shown in b.

Figure 18. The welding joints of the carbon monoxide reservoir units.

Figure 19. Putting up a ceiling slab in the carbon monoxide reservoir building.

Figure 20. A contraction-expansion device used in adjusting the pillar positions.

Figure 21. Making foundations: a) cementing a foundation.

Figure 22. Concrete pouring at the pumping station for recirculation of water used in the steel rolling mill. Transference boarding is used here.

Figure 23. Shaping a unit on a molding table. The photograph was taken as the unit was being raised by a crane conveyor.

Figure 24. Molding removal from a roof beam at the aging area. the unit ages on the base of the mold.

Figure 25. General view of the "Karaf." This building shields the "Kafar," which breaks scrap iron into small pieces so that it can be fed into the blast furnaces

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Construction Developments in Poland During the Past Fifteen Years

[This is a translation of an unsigned article prepared on the basis of materials supplied by the Ministry of Construction and Construction Materials Industry, in Przegląd Budowlany, Vol XXXI, No 12, December 1959, Warsaw, pages 545-549; CSO: 3493-N]

1. Work from the Beginnings

Against the background of the 15 years of effort of the whole society, the effort of the construction workers is particularly striking. The reconstruction of war-damaged or destroyed projects is their job; they supplied and continue to supply to the society new industrial plants ready for production; they complete housing buildings, transport installations, etc.

Starting, just after regaining independence, the implementation of tasks connected with the reconstruction of Poland and the development of its economy, it was necessary to start at the bottom-- first of all, with the organization of the executive apparatus, and this under conditions of insufficient experience (in constructing industrial projects), insufficient technical cadres, shortage of skilled manpower, lack of materials, equipment, etc. In time, the qualifications of the technical cadres improved and the cadres expanded through an annual inflow of the young; great progress was made in the field of mechanization of construction jobs, but the difficulties experienced from the very beginning with the supply of skilled workers intensified considerably while the supply of materials was increasingly disproportionate over the 15 years.

However, construction leaders were equal to their tasks. The difficulties encountered were overcome by all available means within the framework of the more and more systematically implemented principle of planning in construction. A considerable help in this connection was the flexible attitude of the authorities, manifest in adjusting the organization of

construction to the current needs. But first of all, the successes achieved stemmed from technical progress, both in the planning stage and in the processes of execution.

2. Planning and Organizational Flexibility--Factors Facilitating the Development of Construction

The three-year reconstruction plan (1947-1949) has already been implemented in construction on the principle of planned economy. The planning regime was further strengthened during the Six-Year Plan (1950-1955).

In that period, the development trends of construction were determined by the fact that most of its potential was aimed at expanding heavy industry, which--as is well known--is a condition for the development of the other branches of the economy. The most essential influence in this field was exerted by the construction of the W. I. Lenin Combine started in 1949. Lack of experience in construction of large industrial projects, coupled with excessive scattering of the productive potential on functionally heterogeneous projects constructed in Nowa Huta (including housing and social construction), resulted in a temporary breakdown in the construction of the combine in 1949-1950. This situation constituted one of the basic reasons which led the central authorities to separate industrial construction organizationally.

In this way, the Ministry of Industrial Construction (Ministerstwo Budownictwa Przemysłowego) was created on 1 January 1951 (on the basis of the CZBP [Centralny Zarząd Budownictwa Przemysłowego; Central Administration of Industrial Construction]). The new ministry then took over the majority of the tasks connected with the construction of industrial projects. The economic ministries retained only specialized constructions.

Thanks to the help of the Soviet Union--which considerably expanded its aid in designing, supply of installations, and training of specialist initiated with the construction of the Lenin Foundry--in a short time Polish builders bridged the gap caused by lack of experience in the field of large industrial construction. Thence started an expansion of industry unheard of in the history of our nation.

In other fields of construction, after a temporary stoppage of development in the initial period of implementation of the Six-Year Plan, an unusual drive also occurred.

We will not analyze here the dynamics of increase in outlays in the individual branches of the national economy. We do not intend to describe the details concerning the changes in the structure of these outlays in 1946-1958 (in 1944 and 1945 we did not construct new projects). The reader will have a sufficient idea of these problems by glancing at two graphs (Figures 2 and 3 [bar graphs not reproduced here]). Similarly brief and expressive are the two tables, one of which contains a computation of increments of productive capacities in certain types of industry (Table 1) and the other a computation of completed housing rooms in the last 15 years (Table 2).

A glance at these computations gives a picture of the huge jump in the field of construction and assembly production. It proves, among other things, that the differentiation of a separate ministry for industrialized construction involving specialization, not only in this field but also in the remaining types of construction, fulfilled the hopes connected with it. However, in time the negative sides of this organizational form started to emerge. With the increase in troubles connected with this and with raising the qualifications of the construction cadres, the majority of the construction leaders became convinced that a constant and all-embracing introduction of technical progress and the constant improvement of effectiveness and good management in construction was possible only under conditions of a concentration of construction authority and simultaneous decentralization of management of production. The result of this conviction was the merger on 1 July 1956 of the Ministry of Industrial Construction with the Ministry of Construction of Towns and Settlements (Ministerstwo Budownictwa Miast i Osiedli) and the creation on 1 July 1957 of a uniform central organization embracing not only problems connected with the total of construction production but also the production of construction materials. The present Ministry of Construction and Construction Materials Industry (Ministerstwo Budownictwa i Przemyslu Materialow Budowlanych) was created. Simultaneously, within the framework of the gradual shaping of decentralization in the management of production, the authority of construction and assembly enterprises in the field of independent management were increased.

Table 1

Increments in Productive Capacity of Certain Types of Industries As a Result of Investment Activities

Rodzaj przemysłu	Jedn. miary mocy	1950	1951	1952	1953	1954	1955	1956	1957	1958
Elektrownie — ①	MW	85,1	157,2	282,5	346,7	296,1	333,0	173,0	406,0	766,3
Agglomerownie — ②	tys. t/r ^a	—	100,0	140	140	851	751	1193	1030	—
Wielkie piece — ③	Ilość WP, b	—	1	—	2	2	1	—	—	1
	tys. t/r	94	295	60	826	397	400	394	25	620
	Ilość pieców c	4	7	3	1	2	4	2	—	3
Stalownie — ④	tys. t/r	331	510	393	275	237	687	290	—	510
Wyroby walcowane ⑤	tys. t/r	117	100	1092	170	25	1693	700	—	262
Odlewy żeliwne ⑥	tys. t/r	20,8	25,3	17,4	41,0	29,9	20,3	1,3	43,4	34,6
Odlewy stalowe ⑦	tys. t/r	3,3	1,9	2,9	2,0	7,2	0,7	—	30,9	5,9

- 1) Electric plants
- 2) Agglomeration plants
- 3) Big furnaces
- 4) Steel plants
- 5) Rolled products
- 6) Iron castings
- 7) Steel castings

^a 1,000 tons per year

^b Number of WP [not identified]

^c Number of furnaces

Table 2

Increments in Housing Rooms in Towns and Rural Areas in the 1945-1959 Period, in 1,000 Zlotys

Type of Construction

Rodzaj bud. rok	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
Bud. społecz. ①	78,0	78,0	77,0	74,0	66,3	119,4	130,1	134,5	160,8	160,4	181,4	—	—	—
.. prywatne ②	30,0	50,0	25,0	20,0	11,7	59,4	45,8	39,8	47,6	48,9	70,7	—	—	—
Razem ③	108,0	128,0	102,0	94,0	78,0	178,8	175,9	174,3	208,4	209,3	252,1	263,5	340,6	386,6

- 1) Socialized construction
- 2) Private construction
- 3) Total

At present more and more is being said in the building community about the necessity of also subordinating to the Ministry of Construction and PMB [Przemyslu Materjalow Budowlanych; Construction Materials Industry] problems of special construction and problems connected with town planning and architectural policy. There can be no doubt that if the advantages of this concept predominate over the disadvantages it will be implemented in the name of elimination of all potential obstacles to the development of construction.

Organizational flexibility is, as we have stressed, one of the basic circumstances which facilitated the results of construction activities attained so far, but it is not the most important. The first place is taken here by the introduction of technical progress, to which the main part of this article should be devoted.

3. The Main Directions of Technical Progress

In the first postwar years, the entire potential of technical knowledge which could be provided by the technical cadres remaining in Poland, decimated by the occupation forces, had to be utilized in the reconstruction of the destroyed and damaged industrial plants and housing, social, and other buildings. There was neither time nor opportunity for the preparation and popularization of new engineering concepts. Those which found application appeared rather sporadically and did not influence the state of construction technology in general.

With the intensification of the at first slow quantitative increase in technical cadres, and with the increase in tasks, the idea of introducing planning in implementation of technical progress on a large scale started to mature. The beginning of the activities connected with this concept (1948-1949) is closely connected with the organization of state designing bureaus, in which it was endeavored to concentrate the best qualified, creative technical personnel.

Without state designing bureaus operating in accordance with the premises of the national investment plan, it would not be possible even to dream of fulfilling even a part of the ambitious targets in the field of expansion of industry and in the remaining types of construction.

It should be remembered that the expansion of socialized construction presented in the graphs and tables took place under conditions of a disproportionately low increase in production of construction materials. The situation was complicated by growing difficulties in supplying a sufficient number of qualified employees for the constructions. The currently planned program of training had many shortcomings in the past years.

The difficulties listed influenced the direction of work of the state designing bureaus. Their main task became the search for new constructions ensuring maximum economy of materials in short supply, aiming to decrease labor absorption of the construction processes, and facilitating its implementation with a considerable cut in the number of skilled artisans.

Thus arrived the period of intensive mechanization and industrialization of construction and assembly production. At its foundations was a close and systematic cooperation between the designers of various specialties: technologists, architects, constructors, and installers.

This tendency found application first of all in industrial and housing construction.

The development of engineering thinking in industrial construction was initiated in 1948 with the starting of work by the state designing bureaus. Within the framework of cooperation between the above-mentioned specialists in various fields, a proper platform was decided upon with regard to documentation of industrial plants, accepting as a rule all-embracing planning and provision for the use of standardized elements based on a uniform 3-meter module.

In these designs (introduced a year later) it was for the first time in Poland planned to assemble industrial halls made of reinforced concrete elements of great weight, requiring the use of cranes. The construction of these halls constituted a turning point in the technology of industrial construction. To a large extent, the assumed objectives were attained. The use of lumber was considerably limited; the same is true of cement (thanks to the use of higher grades) and the labor absorption was decreased, limiting the participation of certain artisans (mostly masons and some carpenters). Only in the use of steel were no apparent economies achieved. The assembling of the first prefabricated halls involved

steel consumption in quantities of over 30 kilograms per square meter. Hence further efforts of the designing bureaus were concentrated mostly on this problem. As a result, designs started to be prepared which, aiming to decrease the quantities of steel (and cement), eliminated more and more daringly the internal supporting pillars of the industrial halls and used ever larger spans.

Among the first concepts of this kind was the so-called "steel-ceramic" construction. The basic material of this was a thin-walled ceramic ("DS" hollows), out of which, with the aid of mortar, steel reinforced beams were assembled and then roofs were made. The roofs usually had the form of rolled vaults with steel joints. The spans of the vaults were 21 to 24 meters. For the assembly of the roofs, the first Polish movable scaffolding was designed and made, giving large savings in lumber. The technical and economic indices attained were so favorable that the realized prototype designs were standardized for modular spans of 12, 15, 18, 21, and 24 meters and included in the catalogue of standard designs. Thus, they served as ready documentation for the construction of several scores of industrial halls throughout the country (including FSO [Fabryka Samochodow Osobowych; Passenger Automobile Factory] and FSC [Fabryka Samochodow Ciezarowych; Truck Factory]). The method was particularly popular in 1950-1954.

The steel and ceramic construction had considerable advantages, but it also had disadvantages. Among the advantages is the cut in steel consumption to 15 kilograms per square meter. But a serious disadvantage is the slow method of forming and assembling roofs. The tendency to eliminate this disadvantage introduced more progressive compressed and shell constructions in the designing bureaus and therefore also on the construction sites. The concept of string-concrete and cable-concrete compressed elements facilitated the development of mechanization of labor and prefabrication in application to halls with flat coverings. Serial production of elements up to 15 meters long was started in special plants (among others, in Strzybnica). The economic solution of the construction of compressed levers and rib plates limited the steel consumption to 12 kilograms per square meter, even with spans of 36 meters. Among the first projects of this types was the Plant for Crane Installations (Zaklad Urzadzen Dzwigowych) in Warsaw, built in 1953. Compressed constructions were soon standardized, catalogued, and popularized throughout the country. Their development continues.

Simultaneously with compressed constructions there developed in 1953-1955 the concept of prefabricated rolled coverings of reinforced concrete corrugated elements. Thanks to the simplicity of prefabrication, which can be achieved at low cost on piles at the construction site, and thanks to the ease of assembling the elements with the aid of light steel scaffolding, this method became very popular. The basic element of construction is a corrugated plate 0.5 to 1.5 meters wide and 3.0 to 6.0 meters long. The most characteristic projects realized with the aid of this method is undoubtedly the sports hall in Stalowa Wola with a span of 46 meters.

Further progress is represented by the shell construction, which introduces the most modern supporting systems and serious changes in the ideas on architecture, statics, and the technology of construction execution. The construction was used for the first time in building a hall in the "Konrad" coal mine (1950). But the real development occurred in 1952 and 1953, when several large halls were built with shell roofs and a standard pillar network 12 x 12 meters (for example, at the Textile Plants in Zambrow and Fasty).

The first Polish shell constructions constitute, with all their advantages, a certain step backwards in the problem of materials. Namely, they consumed as much as 32 kilograms of steel per square meter of the halls. Only in the construction of halls of the textile plants in Warsaw and Krosno, where shell semi-trough constructions (so-called semi-cloister vaults) were designed, was a notable technical and economic success obtained, lowering steel consumption to about 12 kilograms per square meter.

The last two years (1958-1959) brought further original solutions of hall coverings with the use of compressed shells. For example, last year a market hall was assembled in Rzeszow; for its covering two-plane cable compressed shells (6 x 12 meters) were used, which had been assembled on the construction site and placed directly on the supporting pillars. Also noteworthy is the fact that at its thinnest point the shell was only 3 centimeters thick and that only 5.5 kilograms of steel and 0.05 cubic meters of concrete were used per square meter.

As concerns the limitation of lumber and steel consumption, not much remains to be done in our industrial construction. It seems that the achievements to date constitute in a sense

the optimum of what can be achieved; hence the conclusion that further technical progress in the field of construction of industrial halls will probably go in the direction of the introduction of new and lighter materials to replace steel and concrete.

The development of technical progress in housing construction had a different and less intensive course. Its beginning is usually connected with the creation of the Plant of Workers' Settlements (Zakład Osiedli Robotniczych) and--as in industrial construction--with the creation of state designing bureaus.

Changes did not take place immediately. The habits of builders predominated over new concepts. Only when the preparation of a balance of possibilities of execution of investment tasks showed that we would not be able to cope with the rapidly growing housing needs did progressive methods of technology of construction production slowly gain a foothold. The objective difficulties mentioned in the beginning of the article gradually convinced the technical construction community that the future of housing construction lies in passing from the traditional artisan methods of execution to industrialized methods.

The introduction to the application of the new method was the construction of settlements A 11 and A 31 in Nowa Huta. An experiment was made in using prefabricated ceilings, roofing plates, door panels, and staircases. However, the available technical documentation assuming tradition construction complicated the execution, which fact was reflected, among other things, in the quantity of types of individual elements (for example, as many as 20 types of roofing plates alone). Despite this, the construction of Nowa Huta constituted the beginning of industrialization of the so-called "first degree." On the basis of the Nowa Huta experiences, the following settlements were among those built: Sielce and Bielany in Warsaw, Os Pracy in Czestochowa, Gdansk-Polnoc, Wroclaw-Srodmiescie, and others.

This was the transitional period. A further step was taken in 1954, also in Nowa Huta. At that time the assembling of the first building in Poland made of prefabricated large-block elements was started. But the whole building was not constructed in this way; assembling was limited to the last two levels, using slag concrete blocks. The Nowa Huta large-block construction was characterized by a large number of types

of prefabricates: there were over 40 size standards of wall blocks alone, not counting ceilings, roofing plates, etc.

The first building in Poland assembled completely of prefabricates and consistently designed on a modular net of 40 x 40 centimeters was building No 40, constructed in 1954-1955 in the Praga II settlement in Warsaw. That four-level project has a volume of 8,400 cubic meters and 24 apartments, or 2 PK [not identified] and PK. A total of 63 types of elements with an average weight of 1,200 kilograms were used.

Successful experiments with individual buildings provided an incentive for assembling entire settlements.

The first settlement which was completely designed for industrialized execution and construction wholly in accordance with the premises of the design was the experimental settlement at Kasprzak Ulica in Warsaw (beginning of implementation in 1957). Seven repeated three- and four-staircase buildings were raised there. The total was assembled out of about 80 types of prefabricates (including shelter plates of TOPL [not identified]). These projects constitute an extension of the construction idea of building No 40 of the Praga II settlement, except that it was enriched by joints of loggia, two types of kitchen-bathroom joints, and a shelter. They include various types of apartments from P [not identified] to 3 PK, with luxurious installations.

In 1957 two completely new methods of construction were initiated in Poland:

- [1] construction of monolithic concretes initiated in Gdansk;
- [2] large-plate construction introduced for the first time in Warsaw.

The formation of walls made of monolithic concrete may have various alternatives, according to the type of aggregated used. In Gdansk, an aggregate of brick debris was utilized for this purpose, thus opening a period of construction of porous concretes. With the aid of movable boards, walls of four- and nine-level houses were designed and executed, with a horizontal support system.

This method is finding more and more application, especially since the organizers found time for cutting the production cycle in constructing battery forms instead of wet wall

formation, which permits assembling out of already prepared and matured prefabricates. Using ordinary, so-called "heavy" concretes, it is possible with the same horizontal system of supporting walls to construct tall projects by this method-- for example, the 27-floor building now under construction in Krucza Ulica in Warsaw.

However, the highest level of technical progress is marked at present by the large-plate construction initiated in 1957-1958 in the Kasprzaka Ulica in Warsaw. The first two building have a total volume of 18,400 cubic meters. In 1958 the assembling of large-plate buildings was started in Wola, Bydgoszcz, Lublin, Bialystok, Walbrzych, and other cities. The above-mentioned opinion justified by the following axioms:

[1] Large-plate construction is the most effective in limiting labor consumption among the methods listed, and it shortens the construction cycle.

[2] It limits artisan work to a minimum in the course of raw-state jobs and finishing jobs.

[3] It limits to a minimum the consumption of scarce materials.

[4] It decreases most effectively the weight of the building, limiting the weight to 200 kilograms per cubic meter, while large-block buildings exceed 300 kilograms per cubic meter and brick buildings even 50 [sic; 500?] kilograms per cubic meter.

* * *

We have had great success in developing construction and assembly production. This is beyond doubt. In this connection, it is noteworthy that, apart from objective obstacles (among other things, material shortages and mobility of cadres), the development of that production was affected by shortcomings of designing and executing units. Among them is the fact that plans do not always take into account the current achievements of construction technology and often result in the use of obsolete methods of execution, faulty organization of jobs, insufficient discipline of work and wages, less than the highest quality of execution, lengthy construction cycles, and excessively developed administration.

Without closing our eyes to these shortcomings, it is possible to express the opinion that the Ministry of Construction and Construction Materials Industry, having at present at its disposal large engineering construction cadres and a large quantity of equipment, and in addition supervising the majority of plants producing construction materials, constitutes, under conditions of simultaneous decentralization of management of the operative units, a powerful, expert, and efficient apparatus implementing the building of socialism in our country.

Figure Captions

Figure 1. The losses of Polish industry resulting from military operations, in percentages.

Figure 2. The structure of investment in the national economy during 1945-1958.

Figure 3. Indices of the growth of investments (1950 = 100).

POLAND

Some Actual Problems of Investment Policy

[This is a translation of an article by Aleksander Szerwentke in *Inwestycje i Budownictwo*, Vol IX, No 11, November 1959, Warsaw, pages 1-5; CSO: 3498-N/a]

In every country one of the basic economic problems is the question of the level of investment outlays and the rate of investments. It is important to find a level of investments which would on the one hand ensure that the basic investment needs are covered and on the other hand would not excessively burden the national economy as a whole.

In connection with the current work on the preparation of the National Economy Plan for 1960, the problem of the proper determination of the volume of investments for next year is again timely. The plan for 1960 will to a certain extent be of a specific nature. As is well known, next year is the last year of the current Five-Year Plan. Hence the work connected with it is based to a large extent on an evaluation of the implementation of plans in previous years and on checking whether the ratios of outlays realized in the individual years will indicate the execution of the Five-Year Plan. In the sectors on which some deviations have occurred there is still the possibility of compensating for them by a proper determination of ratios in the plan for 1960. On the other hand, we know that since 1959 we have been realizing a seven-year program in the national economy. Hence the national economic plans for 1959 and 1960, together with their investment plans, must take into account, apart from tasks connected with the current Five-Year Plan, tasks resulting from the seven-year program--that is, the preparation in the course of these two years of the new Five-Year Plan (1961-1965). It is well known that it is not easy to realize plans containing many tasks and several targets, all very important. Hence, the specific situation in 1959-1960 and, among other things, the difficulties in investment activities in recent months.

Since the proper determination of the volume of investments and the optimum rate of investments is a difficult problem, and at the same time very important for the national economy,

it is worthwhile to throw some more light on it. We remember that for the first two years of the Five-Year Plan it was assumed that the share of net investments in the national income would be maintained at a slightly lower level and, in connection with this, the rate of increase of investment outlays would be reduced. It was then important to facilitate in those years a rapid increase in consumption and to compensate for the neglect in this matter during the Six-Year Plan period. This task has been achieved. The share of net investments in national income dropped in that period and therefore the consumed part of the national income increased.

Share of Net Investments in the National Income
(in 1956 Prices)

Year	According to the Five-Year Plan	Execution
1955	-	14.1
1956	13.9	13.7
1957	13.5	13.2
1958	14.6	14.1

In accordance with the Five-Year Plan, in 1958 there was a rise in the rate of increase of investment outlays and therefore a certain increase in the burden of investments on national income. This was connected on the one hand with the settlement in 1956 and 1957 of the most urgent needs concerning an improvement in wages, and on the other hand with the increase in the production of construction materials and expansion of the potential of construction and assembly enterprises, and particularly the termination of the labor problems of these enterprises in the second half of 1958. A rapid increase in employment took place in construction and contributed, among other things, to the fact that the construction and assembly enterprises started the realization of the 1959 plan with a large labor force. Thus, for example, while the average level of employment in construction and assembly enterprises was 625,000 employees in the first quarter of 1957 and 608,000 in the first quarter of 1958, in the first quarter of 1959 it was 656,000.

Although the National Economic Plan for 1959 did not assume a high rate of increase in investment outlays (about 8 percent), already in the first half of the year, in connection with the very good progress of implementation of the investment and construction plan, important financial allocations

were added to the investment plan for this year. A large part of the increases in the plan were connected with the new policy of intensifying investment effort and preparing the front of work for the next Five-Year Plan, particularly in production investments. However, it was not realized in time that, apart from the government decision on added allocations for the investment plan, enterprises and people's councils also made decisions on the implementation of several new investments, allocating to decentralized investments much more funds than was planned for 1959. Thus, for example, enterprises allocated as a rule more than 25 percent of the factory fund to factory housing funds; the drive to construct a thousand schools have greater results than was expected; the cooperative movement collected much more funds for investments than was declared for the plan, etc. This resulted in the fact that the total increase in the plan during eight months of this year amounted to about 5 billion zlotys, and the current investment plan, including additional allocations, was not 8 percent but nearly 15 percent higher than the 1958 level.

After a period of a very successful implementation of the investment and construction plans in the first half of this year, in July and August there was a slowing down of the rate of implementation of the plan. A basic cause of this was the growing materials difficulties, particularly in such materials as cables, steel, and cement. In May and June of this year, there were large-scale shortages of aggregates caused by insufficient railroad transport. It turned out that the high rate of realization of the plan in the first half of the year had not been fully covered by the current deliveries of construction materials and was achieved to a certain extent at the expense of consuming reserves of materials, which showed a disquieting drop at the end of the first half of the year. Thus, for example, in construction enterprises subordinate to the Ministry of Construction and Construction Materials Industry (Ministerstwo Budownictwa i Przemyslu Materialow Budowlanych), in comparing the reserves of certain basic construction materials at the end of June 1959 and in 1958, it was found that there were the following reductions:

	<u>Percent</u>
Cement	48
Wall materials	24
Central heating boilers	
iron	46
steel	76
Cast iron rib pipes	47
Gravel	8

The situation was similar in enterprises of other ministries except that there was a still more considerable drop in reserves in the construction enterprises of the Ministry of Communal Economy (Ministrestwo Gospodarki Komunalnej), the Ministry of Transport (Komunikacji), the SPB [Spoleczne Przedsiębiorstwo Budowlane; Social Construction Enterprises], and local enterprises.

It should also be stressed that the emergence of material difficulties and the reduction of stocks connected with this was influenced not only by excessive additional allocations to the investment plan but to a certain extent also by changes in the structure of consumption of materials. Among other things, a greater use of industrialized methods of construction than was expected increased the consumption of steel and cement.

Certain construction and assembly enterprises, particularly local enterprises, wishing to improve the difficult material situation, started to purchase materials on the market. Such a step, wholly illegal, should be viewed negatively because, by improving the situation in the sector of the investment plan, the supplies to the population were cut.

The difficulties connected with material supplies were compounded by other negative investment phenomena typical of a period of too rapid investment, such as the broadening of deconcentration of investment outlays and the resulting widening of the front of construction work; insufficient preparation of investments from the point of view of documentation on planning and cost estimation, indispensable for the proper execution of the work; loosening of planning discipline, particularly the utilization of rules on the possibility of making changes in the plan in order to introduce completely new items in the plan with a simultaneous nonexecution of other important tasks contained in the plan as passed by the government.

In this situation, the Council of Ministers (Rada Ministrów) passed a resolution concerning the implementation of investments this year, on the basis of which immediate measures were introduced to counter excessive increases in investments. Among other things, a prohibition against new agreements with contractors was introduced, possibilities of making changes in the plan were limited, and requirements concerning documentation were made more severe, giving banks the right to halt financing. A further step was the passage,

on 17 September of this year, of Resolution No 384/a of the Council of Ministers, which obliged ministries and presidia of people's councils to decrease employment and adjust the potential of the enterprises to the material possibilities. At the same time, on the basis of the resolution, detailed studies were started on the state of orders in construction and assembly enterprises in order to eliminate unrealistic orders to the amount of about one billion zlotys.

Despite the introduction of the above discussed limitations, it is expected that the size of investment outlays in the national economy will reach--in 1959 prices--the level of about 84 billion zlotys, which in comparison with 1958 will mean an increase of nearly 15 percent. It is understandable that with such a level of investments the burden of investments on the national income will also increase. The share of net investments in the national income, calculated in 1956 prices, will increase from 14.1 percent in 1958 to about 15.4 percent in 1959.

The burden on the national economy also increased as a result of the addition wage fund, which was needed to realize the additional construction and assembly production following from the increased investment plan. A cut in employment of over 30,000 persons in construction during the fourth quarter in connection with the already-mentioned reduction in the investment plan will to a large extent ease the degree of exceeding the wage fund in construction, but, with a rather tight market situation, any exceeding of the wage fund, even if it is justified by additional construction production, has an effect on the economy.

On the basis of experiences of the current year, pointing to the negative aspects of maintaining a too rapid rate of investment, for 1960 a decreased investment is being prepared assuming an increase in investment outlays in the national economy at a lower scale than was expected in the recommendations for the plan of July of this year. Caution concerning the rate of investments next year results not only from the materials situation and the necessity of rebuilding reserves by construction, but it is to a large extent connected with the evaluation of the general economic situation. The results of the prolonged drought this year will probably still burden the national economy next year and make it necessary to exercise great caution in formulating the economic policy in general and the investment policy in particular. A wide investment program also makes it necessary to increase the wage

fund and therefore the market supply. According to the present evaluations, we shall not be able to afford this next year.

The limitation of the rate of investment next year is not an easy task. Continuation is necessary on the wide front of investment projects now under construction, and in addition, investors have many means of financing earmarked for decentralized investments.

In order to control the volume of investment outlays next year, it is planned, among other things:

a) to prepare an investment plan for 1960 which on the one hand will ensure full coverage of purchases of machines and installations of domestic production and from import, and on the other hand will encompass all the key projects with a range of work properly determined for them; it is assumed that such a plan will not require additional funds or serious changes or corrections in the course of its implementation.

b) to control the sources of funds for decentralized investments and prevent the widening of these investments beyond the limits specified in the plan for 1960; as one means of getting the level and volume of decentralized investments under control, it is planned--apart from improving the records of financial resources--to formulate the principle that decentralized investments are to be implemented, not as before--on the basis of current accumulation of funds--but on the basis of funds accumulated a year earlier; such a system excludes in advance any surprises as to the size of funds which can be used for investments and will permit a better management of the implementation of decentralized investments.

In 1960 the volume of investment outlays in individual farming and individual and cooperative housing construction will certainly not be limited. The allocations of materials for these purposes will be maintained at a level specified in the recommendations for the 1960 plan and will perhaps be even slightly increased. This is justified not only by the priority of needs in these branches of the national economy but also by the fact that construction materials constitute in this case a part of the basket of goods available on the market. In case of a scarcity of this item, it would be

necessary to replace it with other goods, which does not seem possible in the rather tight situation.

Connected strictly with the question of determining the rate of investments and fixing the total volume of outlays for 1960 is the problem of acceptance of proper ratios in the distribution of outlays between the branches of the national economy. Certainly, the tendency toward increasing productive investments faster than unproductive ones, initiated in 1959, will be maintained. As is well known, in the initial years of the present Six-Year Plan, more resources were made available for nonproductive investments, such as housing, schools, hospitals, communal economy, etc. It is assumed for 1960 that, within the framework of productive investments, outlays for agriculture, transport, and industry will increase the fastest. A rather considerable increase in investment outlays for agriculture is connected to a large extent with the development of agricultural circles in the rural areas and the expected initiation, in connected with this, of a program to mechanize agriculture. A considerable increase in outlays is also planned for land improvement and electrification of the rural areas.

The following are among the more important investment tasks in industry in 1960:

[1] A further development of the domestic fuel base, with particular provision for the expansion of coke pit coal and brown coal mining in the Turoszow and Konin regions; a further search for natural gas in Przedgorze; the development of the already documented new deposits of gas; and the preparation of construction of a big oil refinery in Plock.

[2] Intensive implementation of electric power plants, with special consideration for outlays for the construction of plants operating on brown coal, and intensification of the rate of expansion of the electric power network.

[3] Intensive expansion of the metallurgy base in both ferrous and nonferrous metallurgy, especially further expansion of the Lenin Metallurgical Plant, construction of the Warsaw Metallurgical Plant, continuation of the expansion of the aluminum works in Skawina, concentration of geological prospecting work for copper ore in the Lubin-Sieroszowice region in order to prepare the construction of mines.

[4] Considerable expansion of the machine-building industry, particularly in the branches which are to develop export production (such as railroad rolling stock, shipbuilding) or anti-import production (Diesel ship engines, power assemblies, etc.), and in the industry of agricultural machines and tractors, in connection with the increased deliveries for agriculture.

[5] Expansion of the chemical industry and particularly the plastic materials, synthetic rubber, and artificial fibers industries; intensive continuation of the construction of the sulphur combine in Tarnobrzeg; opening of the sulphur enrichment plant; investment preparatory work for the utilization of natural and coke gas in processes of chemical synthesis.

[6] Further rapid development of the construction materials industry and particularly the cement industry--among other things, the opening of the cement plant in Chelm and starting construction on new cement plants in Dzialoszyn, Nowiny, and Rudniki; lime and gypsum, silica, and light concrete industries; and the continuation of the development of "package glass" foundries.

[7] Development of the paper and cellulose industry and intensive development of the industry of fiberboard panels--that is, materials which replace full-value timber raw materials in the construction and furniture industries.

[8] Further modernization and expansion of light industry (textile and leather) and the food industry, in order to obtain new productive potentials, indispensable in view of the increased supply of agricultural raw materials and the growing domestic and export market demands.

In housing construction, the basic problem is to prepare a program for next year that will ensure the construction of the 1.2 million rooms specified in the Five-Year Plan. It seems that this postulate is realistic and the plan for housing construction for 1960 calls for the number of rooms lacking to attain the above figure.

In social and cultural installations, priority is given to the problem of school construction within the framework of the drive to build 1,000 schools. The problem is difficult in that there is a clear tendency toward deconcentration. The committees of school construction, having collected even small funds, want to start construction. Thus the fear arises that

the materials will be dispersed and frozen in prolonged constructions.

Another general basic investment problem, also timely for 1960, is the question of the relationship between the plan of investment outlays and the realization of programs in real terms! It must be said the proper relationships continue to be lacking and even that disproportions often emerge, where the plan of investment outlays is executed or even exceeded and the planned increase in productive and service effects is not attained.

For years, attention has been directed to this problem and the situation not only fails to improve but in certain fields even deteriorates. The greatest influence on the problem of the discrepancy between investment outlays and real attainment is exerted by:

- a) hidden increases in accounting prices between investors and construction enterprises and suppliers of machines and installations;
- b) failure to bring up to date planning and cost estimating documentation, or the execution of work on the basis of improper or incomplete documentation;
- c) recurring errors in planning investments and construction, introduction of constant changes in the course of implementation of plans, etc.

As for the phenomenon of hidden price increases, there is a rather widespread opinion that they have been occurring during the last two years on a rather considerable scale. It must be admitted that--since the popularization in the national economy of principles of economic accounting and the evaluation of work of enterprises on the basis of financial results attained by them--the incentive exists to attain accumulation at all costs, even be re-invoicing and increasing prices for machines and installations.

It could be asked how there can be hidden price increases in investment settlements. In the case of machines and installations for which there are no price lists and which are accounted for on the basis of individual cost calculation, the problem is simple. From time to time such machines simply become, under some pretext, more expensive, and the investor, of necessity, agrees to pay the difference resulting from a changed cost calculation, often changed in the name of making the given enterprise profitable. As for

machines for which price lists exist, the most general cause of price increases and changes in price lists is the so-called change in the assortment of these machines. It is difficult generally to evaluate whether price changes in these cases correspond to the scale of improvements effected in the machines. Studies of certain groups of machines and installations conducted in the middle of the year show that between the middle of 1958 and the middle of 1959 the price of one ton of installation equipment increased by about 28 percent, that of textile machinery by about 20 percent, that of mining machines and installations by about 13 percent, and that of drilling machines and installations by about 15 percent.

In construction, increases in prices, or the so-called re-invoicing, consist in the fact that the construction enterprises, under various pretexts, collect from investors prices higher than accepted in the cost estimate. They have considerable opportunity--for example, they add to the bills charges for work not done at all, or they state that it was necessary to use in construction a different and more expensive material since the one specified in the documents was not available; or transport is calculated over a longer distance than was actually the case. Finally, supplements are charged for work under particularly difficult conditions, despite the fact that there were no difficult conditions, etc. The investor usually knows about this re-invoicing, but he agrees to it because if he refuses the construction enterprise will switch its resources to another construction site and slow down the pace of the work or find some pretext to discontinue the work. The construction enterprise enjoys a monopolistic position in this matter. The extent of the phenomenon of re-invoicing is evident from the data on the volume of accumulation obtained by construction and assembly enterprises in recent years. It is difficult to believe that the work of these enterprises was so much more efficient and the costs so much lower that such an increase in accumulation was obtained. The following data illustrates the volume of accumulation¹ of construction and assembly enterprises over recent years [and that planned for 1959] (in million zlotys):

1955	236
1956	1,718
1957	2,854
1958	3,436
1959	3,767

The above considerations lead to the conclusion that it is necessary to regulate as soon as possible the problem of prices of so-called investment goods. In construction it is necessary to counteract re-invoicing by the widest possible introduction of obligatory lump-sum settlement of accounts for construction projects, and where this principle cannot be introduced it would be necessary to consistently implement the system of temporary settlements for completed elements. We should no longer tolerate the still widespread system of settlement of accounts on the basis of determining the percentage of work completed.

As for machinery and installations, it is necessary to restrict the settlement of accounts on the basis of individual cost calculations and use price lists as much as possible. In addition, it would be necessary, for example, to oblige the Price Commission (Komisja Cen) to maintain records of the results of permits granted to increase the price of machines and installations and to inform the government on them periodically. Such records should answer the question of how much, in absolute figures, over a period of six months or a year, the prices of machines and installations increase. It seems that a detailed study of this problem alone would curtail the granting of permits for price increases.

Another important investment problem that is especially timely in the preparation for the plan for 1960 is the question of the proportion of outlays for investments newly begun and continued and the calculation of the extent to which new investments introduced in the plan will use the investment resources in the following years.

The seven-year program and the preparations in 1959 and 1960 for the new investment tasks of the 1961-1965 Five-Year Plan would indicate the need to devote to newly started projects a larger percentage of investment outlays than was the case in 1956-1958.

However, it is necessary to bear constantly in mind that huge investment resources are still needed to complete the projects continued from past years. It is true that many projects such as pit coal mines, metallurgical plants, and other basic projects of heavy industry as a rule take a long time to construct. But it is also possible to list hundreds of examples of smaller production projects and auxiliary projects that also take several years to construct. One thing is certain in any case--that both large and small investment

projects take much longer to construct than would be assumed from the norms of construction cycles. In order to solve this problem, it would be necessary not only to intensify the study of the desirability and necessity of opening new construction sites but to subject to the same studies and control all the newly started major projects in industry and transportation on the already existing construction sites. Since the existing construction sites are treated as continued investments, the investors have had great freedom in determining the program on such construction sites. It seems that in many cases it would be worthwhile to suspend for some time the start of construction of some projects, even on active construction sites, and to devote the freed resources to speeding up the implementation of projects already in the course of construction. It follows from the drafts of investment plans for 1960 submitted by the ministries that the outlays necessary for the completion of investments now in the course of implementation are about 10 percent higher than the amounts needed to complete the investments according to the situation a year ago. This would mean that our obligations for future years, resulting from investments currently being realized, are constantly growing. It should be pointed out in this connection that in the course of the last two or three years the ministries, in submitting material with data on the size of resources needed to complete the current projects, present each time new and considerably differing amounts. This probably follows from lack of study of this problem, from using different documentation, often incomplete and not converted into current prices, etc. It seems that this problem is of great importance for the determination of the proper investment policy, and that, regardless of the measures which will be undertaken for 1960, it would be necessary as soon as possible to effect a general inventory of investment projects now under construction. Such an inventory, conducted by representatives of investors, contractors, planning bureaus, and banks, should answer at least the following three questions.

1. How much work still remains to be realized and what deliveries of machines and installations are connected with these projects?
2. When can the given investment be completed and how should the work still left be distributed over the years?
3. How much, in current prices, has to be spent over the years to complete the given investment?

The answers to these basic questions, received on time, would be of basic importance for the final formulation of the draft for the Five-Year Plan for 1961-1965 in the field of investments.

Footnote

¹The accumulation constitutes the difference between the value of construction production and the level of costs in the state enterprises in prices of individual years.

POLAND

Generalization of the Formula for
Effectiveness of Investments

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and M. Rakowski in Inwestycje i Budownictwo, Vol
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The discussion on the methods of calculating the effectiveness of investments, both in the USSR and in Poland, has shown that one of the greatest difficulties is in taking into account in the calculation such questions as freezing the investment outlays in the course of construction, differences in the durability of investment projects, and uneven distribution of production and costs over a period of time.

In particular, in the course of the Polish debate on the effectiveness of investments held in June of this year, it was correctly pointed out that these problems were not exhaustively treated in the formula for determining the effectiveness of investments proposed at that time.

On the other hand, it is necessary to state that the suggestion for solving the problem of rate of interest on investments by discounting production, outlays, and costs for the period of opening the plant, with the aid of a rate of interest corresponding to the average rate of development of the economy--a suggestion brought forward during the debate--has no theoretical justification and--what is most important--it sets apart the problem of how effectively operating costs have been reduced by increasing investment outlays with the balance of manpower in the national economy.

The present article constitutes a summation of further methodological work on these problems, in which it was attempted to find theoretically justifiable though still only approximate solutions. It was assumed that two investment alternatives, A and B, have the same effectiveness if investing with method B instead of A does not affect the dynamics of effects on the whole national economy and preserves the equilibrium of the balance of manpower.

I. The Simplest Form of the Formula for Effectiveness of Investments

Let us start by considering a very simplified model of the national economy, in which the construction of projects is "instantaneous" and therefore the problem of freezing resources during construction does not arise; in which all investments have the same life span--let us say 20 years--and therefore there is no problem of different periods of operation; and, finally, in which production and costs are constant throughout the period of utilization of the projects and therefore there is no problem of distribution of production and costs over a period of time. In this simplified situation, there remains only the question of the permissible volume of additional outlays (ΔI) lowering the operating costs (ΔK) in the investment objects compared, which is determined by the limited duration of [the period of] return of outlays (T). The magnitude of T --as was already explained several times¹--should be chosen in such a way as to favor a maximum increase in the national income with the aid of the total available investment resources. Since wide possibilities exist in the economy for lowering costs by replacing old installations with new ones and modernizing them or mechanizing work with the aid of comparatively low investment outlays, in a period of return (T) less than six years, any outlay exceeding this limit for the sake of an additional lowering of costs constitutes a waste of investment resources. The conditions for choosing the second of two comparable alternatives giving the same production can be presented as follows:

$$I_2 - I_1 < (K_1 - K_2) T$$

or

$$\frac{I_2}{T} + K_2 < \frac{I_1}{T} + K_1$$

In other words, the better alternative is that for which the expression:

$$E = \frac{I}{T} + K \quad (1)$$

is lower. This expression corresponds to the expression used so far:

$$\frac{I + Iqn + Kn}{Pn}$$

where $q = \frac{1}{T} - \frac{1}{n}$.

Whereas so far it has been assumed that this expression was correct for any magnitude of the period n , at present we assume that the expression is correct solely for a standard period n_s (let us say 20 years), while for other periods it requires corrections which will be mentioned further on.

II. Taking into Account the Influence of Freezing Investment Outlays in Construction

It is understandable that the length of the period of construction of projects and the resulting freezing of investment outlays exerts an influence on the effectiveness of investments. The question is by what method this influence should be taken into account. First of all, it is obvious that this influence is proportionate to the volume of outlays frozen in the period of construction--that is, to the expression:

$$\sum_0^{t_b} i_t (t_b - t).$$

where i_t = partial outlay borne at moment t from the beginning of construction;

t_b = period of construction;

$i_t(t_b - t)$ = partial freezing of outlays i_t .

We replace this expression with the expression $I \cdot n_z$, where

I = the total of outlays and therefore $\sum_0^{t_b} t$, and n_z is the so-called period of freezing equal to the volume of freezing divided by the total outlay. If the outlays during construction are made uniformly, then $n_z = \frac{t_b}{2}$; if they are concentrated in the beginning of the period of construction,

then $n_z > \frac{tb}{2}$ and if at the end of the period, $n_z < \frac{tb}{2}$.

Let us now consider the general economic result of freezing in construction.²

Let us examine where an actual investment process would lead in the simplified model where construction takes place instantaneously. In this model, the outlays which are gradually frozen in the construction of the project under consideration could be immediately placed at the disposal of the national economy for the creation of income. Let us denote the net national income created annually by a unit of outlay as q_z (we will discuss below the magnitude of q_z). Thus, in the simplified model the income brought by the partial outlays until the end of construction would be $itq_z(tb - t)$. It is quite clear from this that the total income created until the end of construction, with any given curve of partial outlays, would be Iq_zn_z in the simplified model. In other words, as a result of freezing, the outlays for the project under consideration in the simplified system would equal, not I , but $I(1 + q_zn_z)$.

In view of this, formula (1) is subject to the following modification:³

$$E = \frac{I \cdot \frac{1}{T} \cdot (1 + q_zn_z) + K}{P} \quad (2)$$

There remains the problem of determining the magnitude of q_z , that is, the net national income created annually by a unit of investment outlay actually frozen and used in production in a model with "instantaneous construction." Let us assume that these outlays create national income with an average branch structure, and let us denote the capital absorption in creating gross national income as m (that is, m investment zlotys are necessary to obtain one zlotys of gross income per year). In view of this, the gross income per zlotys of investment would be $\frac{1}{m}$ per year, and the net income after deduction of loss of capital--the coefficient of which we denote as r --would be $\frac{1}{m} - v$ per year. It could seem that q_z equals this last magnitude, but at this point an essential correction has to be introduced in our reasoning. The problem is that, in order to obtain additional national income, not only investment outlays are necessary but also additional employment. With an equilibrated manpower balance, it is necessary to use a certain investment outlay to release a proper number of employees in the national economy.

In order to increase the gross income by d , we need to direct not only investment outlays $m \cdot d$ but also outlays to realize the manpower necessary to produce d . Let us denote the wages corresponding to d as $r \cdot d$; the investment outlays corresponding to them with a limited period of return will equal $t \cdot r \cdot d$. In view of this, an increase in gross income by d will require total outlays of $m \cdot d + T \cdot r \cdot d$, and the annual gross income created by one investment zlotys will be:

$$\frac{d}{m \cdot d + T \cdot r \cdot d} = \frac{1}{m + T \cdot r}$$

In other words, with an equilibrated manpower balance, the annual net income per de-frozen investment zlotys amounts not to $\frac{1}{m} - v$ but to $\frac{1}{m + T \cdot r} - v$. Thus, we can finally define q_z as follows:

$$q_z = \frac{1}{m + T \cdot r} - v$$

Assuming that for Polish conditions $m = 2.5$; $T = 6$; $r = 0.5$; and $v = 0.03$,⁴ we obtain:

$$q_z = \frac{1}{2.5 + 6 \cdot 0.5} - 0.03 = 15\%$$

III. Modification of the Formula for Other Than Standard Periods of Operation

So far we have assumed that all projects have the same standard operational period n_s . In view of this, the formulas derived above do not apply where the compared projects have different periods of operation. Below we will try to determine the corrections for production and costs which make it possible to replace a project having a period of operation n with an equivalent project having a period of operation n_s .

Let us take into consideration all the investments effected in the economy with a durability of n years. Let

us assume that investments of this type per unit of time increase by a percent per year and that their capital absorption is m . We assume that m does not change in time. If the total completed investments in the given year are I , last year they were $\frac{I}{1+a}$, and in a year removed by $(i-1)$ years correspondingly $\frac{I}{(1+a)^{i-1}}$. The value of projects working in the given year constitutes the sum of the value of investments completed during n years and therefore amounts to:

$$M_n = \sum_{i=1}^{i=n} I \cdot \frac{1}{(1+a)^{i-1}} = I \cdot \frac{\left[1 - \left(\frac{1}{1+a}\right)^n\right] \cdot (1+a)}{a}$$

With a capital absorption of m , the production of these projects is:

$$F_n = \frac{M_n}{m} = I \cdot \frac{\left[1 - \left(\frac{1}{1+a}\right)^n\right] \cdot (1+a)}{a \cdot m}$$

Let us now calculate the production for an identical investment flow with the same capital absorption but a standard durability of projects n_s . We obtain:

$$F_{n_s} = \frac{M_{n_s}}{m} = I \cdot \frac{\left[1 - \left(\frac{1}{1+a}\right)^{n_s}\right] \cdot (1+a)}{a \cdot m}$$

Thus, the sum of production in the economy with the same investment flow and different periods of duration of projects changes, and the production advantage of constructing projects with a durability greater than n_s (that is, where $n > n_s$) will be expressed by the ratio:

$$F_n = \frac{1 - \left(\frac{1}{1+a}\right)^n}{1 - \left(\frac{1}{1+a}\right)^{n_s}} = Z_n > 1$$

These advantages would be the greatest if $a = 0$ --that is, if we were dealing with simple reproduction. In such a case $Z_n = \frac{n}{n_s}$, which means that, with a longer life span of projects, production with the given investment flow would increase proportionately to the life span of the projects. However, under conditions of widened production--that is, with the total of investment outlays growing from year to year--the advantages resulting from the longer life span of projects are of much less importance because the much lower investments of the past periods have a correspondingly smaller effect on the total volume of production. Thus, assuming $a = 7$ percent, which corresponds to the rate of increase of the total of production investments under Polish conditions, we will obtain with $n_s = 20$ years the following magnitudes for the coefficient Z_n (in percentages):

n	5	10	15	20	25	30	35	40	∞
Z_n	38,6	66,1	86,0	100	110	117	123	126	131

Thus, with a durability double the standard one, the advantages of increasing the sum of production would amount to 26 percent, and with an infinite duration only 31 percent. This shows clearly that in an expanding economy greater durability of projects gives a smaller advantage than in an economy with simple reproduction.

Let us now imagine that we replace every object having a life span of n years with an object having the same investment outlay but a life span of n_s and a capital absorption lower in the ratio of Z_n . In view of this, if the annual production of an actual plant is P , the production of the substitute plant will be PZ . It can easily be observed that in both cases--actual and substitute--we will obtain with these assumptions the same flow of investments and production. This same flow of investments results from the equality of outlays in actual and substitute objects. As for the production, according to the proof given above, the same flow of investments for the life span of objects equal to n will give a flow of production Z_n times as high as with life span n_s with the same capital absorption. In the substitute case, with the life span of objects n , their capital absorption of production was lowered in the ratio Z_n , so that here again the flow of production is increased Z_n times and is therefore equal to the actual flow of production.

Of course, with a longer period of operation of objects there is a correspondingly higher flow not only of productions but also of costs. In order to take this factor into account, it is possible to use reasoning analogous to that previously used in the case of production, but introducing an essential correction. The problem is that, with the given investment flow growing yearly by a percent, the costs of production of new projects completed in the given year are higher than the costs of production of projects completed in the previous year, not by a percent but by a lower percentage--c--because of the successive lowering of unit costs of production in the projects opened later, thanks to technical progress. With the aid of the same reasoning, we will find that with the same investment flow of projects of higher durability than standard there is a correspondingly higher total of costs than with standard durability in the ratio Y_n defined by the formula:

$$Y_n = \frac{G_n}{G_{n_s}} = \frac{1 - \left(\frac{1}{1+c}\right)^n}{1 - \left(\frac{1}{1+c}\right)^{n_s}},$$

where G_n and G_{n_s} represent the total costs for the periods n and n_s . Y_n , with $n = 20$ years and $c = 3$ percent, will have the following magnitudes (in percentages):

n	5	10	15	20	25	30	35	40 ∞
Y_n	31	57	80	100	117	132	145	155 227

Using the same reasoning for costs as when considering the problem of production, it can be proved that the substitute plant with a standard durability of n_s should have higher operating costs with relation to Y_n . Thus, if the costs of an actual plant with a life span of n years are K , the costs of a substitute plant with a life span of n_s years will be KY_n .

Thus, if we deal with a plant with a life span of n years, production P , and operating costs K , we can replace it with a plant having a life span of n_s years with the same investment outlay, and with production PZ_n and costs KY_n . In view

of this, the formula for the effectiveness of investments for a plant with an operating period of n will take the form:

$$E = \frac{I \cdot \frac{1}{T} (1 + q_1 n_1) + K Y_n}{P \cdot Z_n} \quad (3)$$

This formula can also be presented as follows:

$$E = \frac{I \cdot \frac{1}{T} (1 + q_1 n_1) \frac{1}{Z_n} + K \frac{Y_n}{Z_n}}{P}$$

An improvement in effectiveness in the case of greater durability of the object with regard to the standard period occurs in the form of a decrease in the expression depending on investment outlays in the ratio Z_n . However, an increase in operating costs in the ratio $\frac{Y_n}{Z_n}$ (which is greater than unity) lessens the effectiveness. Expressed in this is the loss resulting from fixing the initial operating costs for a long period in more durable objects, thus limiting the possibilities of benefitting from technological progress. The predominating influence depends on the ratio of $K:I(1 + q_1 n_1)$. For example, for hydroelectric plants whose operating costs are very low, taking into account their durability greatly improves their effectiveness.

It should be stressed that a rate of increase of production of new plants, a percent, and the rate of increase of costs in these plants, c percent, may not be the same for objects belong to various durability groups--that is, they can vary where n is different. For lack of information in this field, we accept the same a percent and c percent for all durability groups--namely, 7 percent and 3 percent, as above.

IV. Modification of the Formula, Taking into Account the Changing Course of Production and Costs during Operation

Let us again consider the flow of production of projects with a life span of n years and a rate of increase of investments in these projects of a percent per year. For the capi-

tal value of plants working in the given year, we obtained the formula:

$$M_n = \sum_{i=1}^{i=n} I \cdot \frac{1}{(1+a)^{i-1}}$$

where I = investments of that year.

We now reject the assumption that production of the given project is constant during the period of operation. Let us divide the plants under consideration into classes according to the shape of the production curve during their existence. Let us assume that the parts of the investment flow corresponding to them show the same rate of increase, a percent, per year. The above formula for the capital value of plants in the given year will therefore remain valid for each of these parts. (I will now represent the investments of the given year and M the capital value of plants working in the given year with regard to the [specific] part of the flow).

Let us now calculate the production of the plants [in terms] of the part of the investment flow in the given year. Let us denote the ratio of production of the plants in 1 year to their capital value as w_1 .

In the given year the plants opened $i - 1$ years ago will have a production characteristic for the i year of their existence. Thus, the production of plants opened $i - 1$ years ago will be expressed by the formula:

$$I \frac{1}{(1+a)^{i-1}} \cdot w_1$$

In view of this, the formula for the part of the production flow with any given shape of distribution will be as follows:

$$F_n = \sum_{i=1}^{i=n} I \cdot \frac{1}{(1+a)^{i-1}} \cdot w$$

Let us now imagine that we obtain a production F_n of the same magnitude, with a constant w and the same part of the investment flow. We will then have:

$$\sum_{i=1}^{i=n} i \cdot \frac{1}{(1+a)^{i-1}} \cdot w = \sum_{i=1}^{i=n} i \cdot \frac{1}{(1+a)^{i-1}} \cdot w_{st}$$

where w_{st} can be called an equivalent of w_i . It follows from the above equation that:

$$w_{st} = \sum_{i=1}^{i=n} i \cdot \frac{1}{(1+a)^{i-1}} \cdot w_i \cdot \frac{1 - \left(\frac{1}{1+a}\right)^n}{a}$$

From here it is only one step from the case where production changes during operation of the given project to the case of constant production. Let us assume that we substitute for each plant with a given distribution of production changing during operation a plant with the same investment outlays and constant production, the level of which is:

$$P_{st} = \sum_{i=1}^{i=n} P_i \frac{1}{(1+a)^{i-1}} \cdot \frac{1 - \left(\frac{1}{1+a}\right)^n}{a}$$

It can easily be noticed that the substitute plants will produce the same part of the production flow as the actual plants. In this way the above equation gives us a volume of constant production which is equivalent to changing production. The formula derived is based on the assumption that the parts of the investment flow corresponding to the individual types of distribution of production have a constant share in this flow. Since this corresponds to reality only approximately, the above formula cannot be considered as wholly exact.

An analogous reasoning can be applied to the costs changing during operation. Here we will obtain for the equivalent of changing costs:

$$K_{st} = \sum_{i=1}^{i=n} K_i \cdot \frac{1}{(1+c)^{i-1}} : \frac{1 - \left(\frac{1}{1+c}\right)^n}{c}$$

Now we can generalize the formula of effectiveness of investments for the case of production and costs changing during the period of operation, replacing P and K and P_{st} and K_{st} as defined by the above formulas:

$$E = \frac{1 \cdot \frac{1}{T} (1 + q_2 n_2) + K_{st} \cdot Y_n}{P_{st} \cdot Z_n} \quad (4)$$

This formula for the effectiveness of investments takes into account the freezing of outlays during construction, a durability of the project different from the standard, and finally the changes in production and costs over a period of time.

In conclusion, we wish to stress that we consider the above derived formulas only as a better approximation to the complex economic reality than those used previously, and not as the final solution to the problem.

Footnotes

¹See, for example, M. Rakowski: "Maximization of Economic Growth and the Interest on Outlays," Gospodarka Planowa, No 10, 1959.

²The following reasoning coincides with the reasoning contained in an article by M. Kalecki, "On the Coefficient of Freezing," Ekonomista, No 1, 1959.

³In the draft of recommendations presented in June of this year, as in the recommendations of 1956, the following formula was suggested:

$$E = \frac{1 + 1 q_2 n_2 + 1 q_n + K_n}{P_n}$$

For the standard period of operation, this formula corresponds to:

$$E = \frac{I \cdot \frac{1}{T} - Iq_z \frac{n_z}{n_s}}{Pn}$$

It is clear that in this way the influence of freezing is incompletely expressed because the relevant part of the numerator here is $\frac{Iq_z n_z}{T}$, while in the new formula it is much more: $\frac{Iq_z n_z}{T} n_s$

The difference between the 3-percent loss of capital and the depreciation of 5 percent per year is explained by the rapid expansion of the stocks of fixed capital.

POLAND

Investment Problems as Reported by the Supreme Chamber of Control

[This is a translation of an article by Stefan
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The controls of investments undertaken by the Supreme Chamber of Control (Najwyższa Izba Kontroli), in view of the small controlling apparatus and the diversity of control problems, do not encompass the total of investment activities on the national scale or in the individual branches of the economy. Nevertheless, a certain continuity of control of certain aspects of investment activities and concentration of attention on some selected problems in various branches of the economy give a picture of shortcomings and errors in the investment activity which require at least a brief discussion in view of their recurrence over a long period of time as well as their universality.

Although they set in order many problems concerning the organization of planning, financing, and execution of investments, and in spite of the evident general improvement in the results of investment activities, the controls carried out by the NIK [Najwyższa Izba Kontroli; Supreme Chamber of Control] show still recurring irregularities in the programming and preparation of investments for realization; lack of sufficient effectiveness and even undesirability of investment outlays; prolonged realization periods; and increase in costs.

All these irregularities seriously delay the execution of real investment tasks; they contribute to ineffective freezing and even to waste of considerable resources; and as a result they slow down considerably the realization of other important economic targets based on the increased productive and service capacity called for in the investment plan.

The major cause of these irregularities and omissions in the activities of investors, as the controls show, is often their improper attitude toward spending investment funds originating mostly from allocations and their lack of proper

responsibility for the almost universal nonobservance of valid rules.

The following is a brief summary of the most frequently recurring errors and shortcomings in investment activity shown by the NIK control, grouped according to the basic controlled problems and illustrated first of all by examples from control of local investments.

1. Programming and Preparation of Investments for Realization

As the controls have shown, investments are still quite often undertaken without a proper study of the investment needs and conditions in which the future investments are to be realized.

The lack of previous programming of investments by means of proper economic and technical studies and lack of proper studies concerning demands for productive and service capacity and the conditions of location, execution, and operation of planned investment projects often lead to improper preparation of investment assumptions.

Incorrect investment assumptions containing basic shortcomings create serious difficulties in planning work and become the cause of errors in planning and documenting cost estimates and of prolonged preparation.

Changes which later turn out to be unnecessary are often made in investment concepts and programs during the course of realization of investments, even after considerable outlays have been made and numerous jobs or even complete investment projects executed.

Tash investment undertakings, improper programming and preparation of investment assumptions, and the prolonged preparation of planning and documenting cost estimates most often connected with it are among the causes of investment plans being included and construction being started without approved basic documentation.

Investments have been included in the investment plans without basic planning and cost estimate documentation and

implementation has been started without the indispensable minimum of documentation for many years, and this practice still continues despite the reservation contained in the Instructions of the Planning Commission (Komisja Planowania) at the Council of Ministers (Rada Ministrow) concerning the preparation of the NPG [Narodowy Plan Gospodarczy; National Economic Plan] prohibiting the inclusion in investment plans of investments lacking a preliminary draft and a technical plan concerning the realization of the given year.

In general, when new investments are introduced into the investment plan, it is intended to prepare the lacking planning and cost estimate documentation during the plan year, but because of various changes in concepts, revisions, and delays in the preparation of documentation--accepted by the proper authorities--the preparation of documentation became so prolonged that the investments have not only been started but have even been realized for many years without approved preliminary plans and without complete technical drafts.

Particularly where investments of local plans are concerned we observe a phenomenon of numerous new investments being included in the investment plans of each year without complete and approved planning and cost estimate documentation.

Apart from that, where prolonged investments already under implementation are concerned, there is a large-scale lack of timeliness and realism of documentation, particularly of cost estimates.

As the NIK control in coal mining has shown, improper preparation of investment programs and realization of investments occur because of insufficient study of geological conditions through drilling. This contributes to delays in the preparation of planning and cost estimate documentation and to the start of construction of new mines with incomplete and not approved documentation, and to frequent changes in concepts and assumptions even in the course of realization of investments.

For example, in 1958, without approved preliminary plans, the realization of investments in projects in the following mines was included in the investment plan and started: "Rozbark," "Chwalowice," "Moszczanica," "Boze Dary," "Katowice," "Halemba," and "Nowy Wirek."

There is also a similar situation in many mines this year.

In power investments, examples of prolonged preparation of planning and cost estimate documentation of investments already in the course of realization are the construction of the "Konin," "Lodz II," and "Bielsko-Biala" electric power plants.

In the Ministry of Heavy Industry, as a result of lack of previous programming of investments by proper technical and economic studies and the delays in the preparation of planning documentation, for many years it has been the policy to start investments and even continue them for many years without approved basic documentation. In 1958 the Ministry of Heavy Industry executed about 7 percent of the total continued investments without approved preliminary drafts, some examples of which are the construction of the Szczecin Electro-technical Materials Manufacturing Plants (Szczecińskie Zakłady Wytworcze Materialow Elektrotechnicznych) started in 1957, the construction of the Jelcza Automobile Plants (Jelczanski Zaklady Samchodowe) started in 1955, and the construction of four mines in the Mining Plants (Zaklady Gornicze) in Leczyca started in 1957.

The Ministry of Heavy Industry also included about 10 percent of their investments in the 1959 investment plan without having approved basic planning and cost estimate documentation.

In the Ministry of Construction and Construction Materials Industry, such investments as the construction of the "Nowiny" Cement and Lime Combine (Kombinat Cementowo-Wapienniczy "Nowiny") and the construction of the "Nowa Huta" Cement Works were introduced in the 1958 investment plan without draft assumptions; the construction of the quarry in Skarocice, the construction of rotating furnaces in the Gypsum Plants (Zaklady Gipsowe) in Gacki, the construction of the Wall Plates Plant (Zaklad Plytek Sciennych) in Opoczno, the Factory of Sanitary Enamelware (Fabryka Fajansu Sanitarnego) in Kolo all lacked preliminary plans. Outlays for investments not prepared for realization in 1958, amounting to 90 million zlotys, were transferred to the reserve of the plan on the motion of the NIK control.

In this respect, the situation did not change in 1959.

In the Ministry of Light Industry, the NIK control has also shown a lack of sufficient provision for full planning and cost estimate documentation of investments introduced in the 1958 plan, including investment projects realized for

many years--for example, the Plant of the Cotton Industry (Zakłady Przemysłu Bawlnianego) in Fasty, the Lodz Plants of the Wool Industry (Lodzkie Zakłady Przemysłu Welnianego), the Kepice Tanning Plants (Kepickie Zakłady Garbarskie), etc.

According to the evaluation of the Investment Bank (Bank Inwestycyjny), about 20 to 30 percent of the investment targets in cotton and wool enterprises did not, at the beginning of 1959, have preliminary plans, or else these plans were obsolete. As a result of this, in 1959 the Investment Bank refused to finance, wholly or partly, 20 investment projects with a total allocation of 229.9 million zlotys.

A similar situation was noted in other ministries.

As for investments of the local plans, the NIK controls have revealed omissions in programming and improper preparation of investments among almost all the controlled investors.

The control of investments of the local plan of Warsaw has shown that out of 114 titles in the investment plan for 1958 (excluding the DBOR [Dyrekcja Budowy Osiedli Robotniczych; Administration of Workers' Settlements Construction] investments) 34 titles were introduced without the required minimum of planning and cost estimate documentation. For this reason, 11 titles in a total amount of about 15 million zlotys were not started during the year and were struck off the plan. Also included in the investment plan for 1959 were 13.2 percent of the titles not having the minimum of required documentation, including 36.4 school investments.

The control on the Health Department (Wydział Zdrowia) of the Presidium of the Warsaw WRN [Wojewodzka Rada Narodowa; Wojewodztwo People's Council] has shown a particularly prolonged preparation of planning and cost estimate documentation for hospital investments, coupled with constant changes in programs.

For example, in 1954 assumptions were prepared for the construction of a powiat hospital in Blonie with 200 beds, to be completed in 1956. The concept was thereafter changed twice to 270 and 285 beds, and the completion of construction was postponed to 1963.

The preparations for the construction of a hospital in Ostroleka were started in 1952, but by the end of 1958 the planning and cost estimating documentation had not been prepared.

The preparations for the construction of a hospital in Ostroleka were started in 1952, but by the end of 1958 the planning and cost estimate documentation had not been prepared.

In a total of six projects under the control program, it was found that 700,000 zlotys were spent for unnecessary and not utilized documentation.

The Health Department of the Presidium of the WRN in Kielce, as a result of improper preparation of investment undertakings lacking legal and technical documentation, introduced in the investment plan for 1958 several projects, such as the hospital in Opoczna, the regional dispensary in Radom, the hospital in Busko, expansion of the hospital in Chmielnik and Opatow, the health center in Kunow and Ozarow. As a result of this, by the end of the third quarter, the plan for health investments was changed five times.

In school investments in Kielce Wojewodztwo, out of 20 controlled investment titles, in 11 cases the investments introduced in the investment plan for 1958 did not have approved planning and cost estimate documentation--for example, the construction of the school and special establishment in Kielce, and the construction of elementary schools in Wozniki, Karczyn, and Opatowiec.

The case was similar in the preparation of communal investments in Kielce Wojewodztwo.

The growing tendencies to start construction without technical documentation were shown by controls of communal investments in Warsaw and Bydgoszcz Wojewodztwos, for example:

In Warsaw Wojewodztwo the investment plan for 1957 included 16 constructions without technical documentation (61.5 percent of the newly introduced titles), and the plan for 1958 included 27 [such] constructions (100 percent).

In Bydgoszcz Wojewodztwo, included in the 1957 plan despite lack of documentation were 12 constructions (that is, 50 percent), and in 1958, 18 constructions (about 66 percent), despite the possession of 12 unnecessary or premature documentations executed at a cost of 2 million zlotys.

In connection with the lack of documentation and unrealistic investment allocations, many changes were introduced in the annual plans--for example, in Warsaw Wojewodztwo the plan for communal investments in 1957 was changed in 53 percent of the items and in 1958 in over 60 (63 items out of 103).

2. Desirability and Effectiveness of Investment Outlays

Cases of execution of unnecessary investments showing unjustifiable overgrowths, unsuitability for utilization under specified conditions, or complete undesirability are frequently encountered in connection with the above-discussed omissions in programming and preparation of investments.

Omissions in preparation, planning (dispersal of resources), and realization of investments also decisively influence the low effectiveness of investment outlays expressed in ineffective freezing of resources for a long period and in failure to obtain at the expected time the planned increment in productive or service capacity.

The productive effectiveness of investments which are partly opened for operation is generally very low in proportion to the outlays.

Ineffective outlays resulting from insufficient utilization of completed projects also occur in cases of improper synchronization between interdependent branches of production and in cases of failure to preserve the proper order or realization of individual projects.

The situation concerning the undertaking of unnecessary investments or insufficient effectiveness of investment outlays is illustrated by the following examples:

a) Several unnecessary or premature investment undertakings with a value of many hundred million zlotys were found by the NIK control in the field of the intended construction or expansion of hydrological projects, for example:

[1] The "Walbrzych-Bukowka" Hydrological Project, with a planned cost of construction of 300 million zlotys--scheduled for current realization, was found to be unnecessary for at least 10 years and was discontinued.

[2] The hydrological project in Zyrardow, with a planned cost of about 100 million zlotys, was found to be unnecessary in view of the possibility of covering the needs through the execution of supplementary work at the cost of a few million zlotys; the investment was given up.

[3] The planned wide investments in Wroclaw, consisting in expanding and constructing new water supplies, for the realization of which about 130 million zlotys were slated by 1965, were found by the NIK control to be partly unjustifiable in view of the possibility of covering the needs at a cost of about 30 million zlotys.

The basic cause of this, according to the finding of the control, was first of all lack of studies on current and future needs for water, improper preparation of water balances, and neglect of the possibilities of development and better utilization of the existing water supplies (e.g., inoperative sources of supply in industrial plants).

b) Without making proper studies, the CZ [Centralny Zarzad; Central Administration] of Coal Construction (Budownictwo Weglowe) decided to construct at the mine in Brzeszcze a Factory for Slag Concrete Prefabricates (Wytownia Prefabrykatow Zuzlobetonowych) at a value of 12.5 million zlotys; in the course of implementation of the investment and after engaging outlays to the amount of 5,560,000 zlotys for planning documentation, purchase of machinery, construction of facilities, etc., it turned out that the raw material base, which was to be boiler slag, was insufficient; thus the construction was discontinued, the machines purchased were transferred to other plants, and the facilities constructed, valued at 2,470,000 zlotys, were left as a production unit of field character.

c) Tendencies toward execution of superfluous outlays were shown by controls of realization of the local investment plan in the field of administrative construction conducted in the Presidia of the Wojewodztwo People's Councils in Lublin, Kielce, Rzeszow, Zielona Gora, and Koszalin. Among other things, the NIK control questioned the necessity of the following investments: construction of the town hall in Koszalin at an estimated cost of 14 million zlotys; construction of the "B" wing of the building of the WRN Presidium in Zielona Gora, valued--including cost of planned demolition of existing buildings--at about 15 million zlotys; construction of the second wing of the Presidium of the MRN

[Miejska Rada Narodowa; Municipal People's Council] in Kielce; construction of an office building for the Wojewodztwo Agricultural Administration (Wojewodztwo Zarzad Rolnicta) in Lublin; superstructure of the Powiat Court (Sad Powiatowy) in Ropczyce for the needs of the Presidium of the MRN, etc. In all the cases listed, possibilities existed of satisfying the needs without investment expenditures for new construction and the questioned investments were given up.

d) Control of desirability and effectiveness of investment outlays in the construction materials industry has revealed expenditures for the construction of a Factory for Glass Fibers (Fabryka Przedzy Szklanej) in Gorlice of about 30 million zlotys, despite the fact that it was possible to open similar production with much lower investment outlays at the "Polanka" Glass Furnace, the construction of which has been prolonged for many years as a result of lack of funds. The control of investments conducted in the Union of Lime and Gypsum Industry (Zjednoczenie Przemyslu Wapienniczego i Gipsowego) in Krakow has shown several cases of outgrowths in planning, consisting in the use of unjustifiable expensive solutions, superfluous usable areas, namely:

[1] in the "Rudnik" ZPW [Zaklady Przemyslu Wapienniczego; Plants of the Lime Industry], in the plan for the construction of the fuel storage place (uneconomic solutions increasing costs);

[2] in the "Strzelce Opolski ZPW, in the design for the construction of a storage place for chamotte (unnecessary ramp and the possibility of using a lighter construction) and a warehouse for spare parts (existence of nonutilized warehouse space);

[3] in the "Gorazdze" ZPW, in the design for the technical warehouse (unjustifiable excess of space);

[4] in the "Bielawy" ZPW, in the design for an administrative building (excess of usable area and superfluous equipment).

In general, in 13 projects with a cost estimate value of 16.2 million zlotys investigated during the control, it was found possible to lower the cost of construction by 2.7 million zlotys--that is, by 16.5 percent. A correction in plans was made as a result of the control.

e) In the Ministry of Food Industry, insufficient effectiveness of investment outlays was found in the meat industry as a result of investments undertaken without proper

preparation of documentation, supplies of installations and materials, provision for proper contractors, etc. As a result, the planned increase in productive capacities corresponding to the investment outlays was not obtained.

Insufficient effectiveness of investment outlays is particularly evident in reconstructions and expansions of meat plants. Excessive increases in outlays for these investments, in relation to the effects obtained, illustrates, for example, a comparison of the increment of one ton of productive capacity of the expanded plants (Lublin, Wroclaw, Tarnowskie Gory, Pabianice) with the corresponding cost of a newly built meat plant in Zamosc. Despite the fact that in the construction of the Zamosc plant several errors were made which contributed to the excessive prolongation of the investment cycle and increased the outlays, the cost of increment of one ton of productive capacity was 50 percent lower in that plant than in the expanded or reconstructed plants.

3. Deconcentration of Outlays

With improper preparation of investments in designing, serious errors arise in planning the realization of investments, manifested first of all in the lack of proper synchronization between planning outlays and the actual range of investments, in dispersal of resources between several simultaneous investments on a too broad front, and lack of observance of norms of construction cycles in planning investments.

With sufficient interest lacking in the effectiveness of investment outlays originating from allocations in the case of centralized investments, many investors consciously dispersed resources among a large number of simultaneous investments, clinging to the plan with small allocation in the belief that they would have to obtain further allocations for the investments started.

Although in general some progress is already marked in concentration of outlays in order to speed up the completion of the more important long-range investments, the situation in this field has not yet seriously improved.

As the NIK controls have shown, the tendency still prevails, particularly in local investments, to disperse resources by constantly introducing in the investment plans new investments with a large number of continued investments.

It was also found in many cases that the norms of construction cycles confirmed by Resolution No 255/58 of the Council of Ministers are not observed in the inclusion of investments in the plans for 1959.

In the industrial ministries, a large deconcentration of outlays for investments conducted on a wide front took place in the past few years, causing a serious freezing of outlays in continued investments. This means that much more attention must be devoted to the completion of investments continued for several years.

However, the results of the control do not indicate a sufficient effort on the part of investors in this direction.

For example, in the Ministry of Light Industry, despite the considerable prolongation of economically important investments, there is a tendency to start new investments that exceed the possibilities of financing and execution. Thus, in 1958 the cost estimate value of newly started investments was 15 percent of the value of continued investments, and in 1959 the cost estimate value of new investments, which almost doubled in comparison with 1958 (195 percent), already constitutes 22 percent of the value of continued investments.

In the Ministry of Food Industry and Purchases, with the considerable prolongation of the construction cycles of most of the continued investments, the front of work is also being widened through the introduction in the plans of more and more new investments. While the outlays for newly started investments amounted to 73.9 million zlotys in 1957, 146.8 in 1958, and 234.6 in 1959, at the same time the volume of resources frozen in uncompleted investments increased.

A typical example of excessive dispersal of investment resources and--in connection with this--of considerable prolongation of construction cycles are the investments of the Petroleum Products Center (Centrala Produktow Naftowych), particularly the construction of commercial warehouses. Despite the noncompletion and nonopening of projects started in the past few years, the construction of new warehouses is being introduced into the investment plans every year.

Excessive dispersal of resources for local investments carried out on an excessively wide front is illustrated by the following examples:

The control of realization of investments of the local economic plan of Warsaw has shown that the number of titles in the investment plan, which in the beginning of 1958 was 236, rose during the year to 304, increasing the already broad front of work. With this, only 57 percent of the total annual investment outlays (excluding DBOR investments) was devoted to continued investments. The ratio of resources frozen in continued investments to the total cost estimate value increased from 68 percent in 1957 to 72 percent in 1958. The prolongation of investment cycles was determined, among other things, by the distribution of allocations for 1959, which did not take into account the norms of construction cycles defined by Resolution No 255/58 of the Council of Ministers. For example, the construction of the fuel warehouse at Elblaska Ulica was planned for three years, while an investment of this kind should be completed in one year; the construction of the music school in Zoliborz was planned for three years, while the investment cycle for projects of this kind should amount to two years; the construction of the house for pensioners in Mlociny was planned for three years, while the norm cycle is two years.

In Warsaw Wojewodztwo in the field of communal investments, nonobservance of [the recommended] concentration of outlays frequently prolongs the execution of the investment by two years or more. For example, the construction of the drainage ditch and water works in Siedlce, with cost estimate values of 6 and 4.5 million zlotys, was introduced into the 1958 investment plan with allocations of one million each, extending the realization of the investment by two years. On the construction of the collector [of water?] in Ostrow Maz., going on since 1956, the allocation of one million zlotys granted for 1958 was already changed in April of that year. Thus this investment will take about two years longer to complete.

There were similar irregularities in the concentration of resources in housing construction of the Presidium of the Warsaw WRN, which in 1958 concerned almost one third of the total of constructions started, in this way prolonging their realization. For example, a building in Nowy Dwor with a cost estimate value of about 5 million zlotys was introduced into the plan with an allocation of 400,000 zlotys.

Control of investment activity of the Health Department of the Presidium of the Warsaw WRN has also revealed a dispersal of resources and, among other things, too low planning of outlays for the first years of construction. For example, in 1958 the construction of a Sanatorium for Bone and Joint Tuberculosis (Sanatorium Gruzlicy Kostno-stawowej) in Otwock was started with [an estimated] cost of 73 million zlotys and slated for completion in 1962. However, in the plan for 1958 a limit of 3 million zlotys was granted for the realization of the investment, and in the draft plan for 1959 only one million zlotys, while according to the norm of construction cycles the distribution of outlays for this project should be 14.5 million zlotys in the first year, 25.5 million zlotys in the second and third years, and 7.2 million zlotys in the fourth year.

In the draft plan of health investments of that wojewodztwo for 1959, 64 percent of the newly introduced titles had construction cycles twice as long as was provided in the norm.

In Poznan Wojewodztwo there is a similar dispersal of resources and therefore prolonged construction already in the planning stage of hospital investments. For example, the construction of the Powiat Hospital in Turek, with a cost estimate value of 33 million zlotys, was included in the investment plan for 1958 with an allocation of one million zlotys (that is, about 3 percent of the cost estimate value), and the distribution of outlays for the following years provides for the completion of construction in 1962--that is, five years later; the construction of the municipal hospital in Ostrow Wlkp., with a cost estimate value of 52 million zlotys, also entered the 1958 investment plan with an allocation of 3.4 million zlotys (about 6.7 percent of the cost estimate value), and the outlays for the forthcoming years were planned through 1963, thus prolonging the construction cycle to six years.

Examples of deconcentration of outlays in Kielce Wojewodztwo are such investments as the construction of a hotel in Kielce with a cost estimate value of 21.3 million zlotys, which was planned for a period of five years, fixing the volume of outlays for the first two years at 10 percent of the cost estimate value, while the period of construction should not be longer than three years; and the construction of the "Nalczew" water works near Radom, which was planned for four years, but the present allocation of outlays for the first two years (9 and 18 percent) with relation to the still

incomplete cost estimate value does not ensure the fulfillment at [even] this prolonged date.

The dispersal of outlays in school investments in Kielce Wojewodztwo is evident from the introduction into the investment plan for 1958 of 46 new titles, with the continuation of 37 investments and investment outlays at 6 to 30 percent of the cost estimate values instead of the minimum of 53 percent. For example, for the construction of a school and a special establishment in Kielce, with a cost estimate value of 12 million zlotys, the 1958 allocation was only 710,000 zlotys.

As a result of this, school constructions which should take two years will go on for three or four years.

4. Prolonged Execution of Investments

Errors in the preparation and planning of investments (particularly with dispersal of resources), which were mentioned before, coupled with errors of organization of execution and omissions on the part of investment supervision, lead almost universally to excessive prolongation of the realization of investments with relation to the previously fixed dates and norms of construction cycles.

Connected with the problem of prolonged realization of investments is the question of nonexecution from year to year of the planned tasks (completion of projects). The dates of completion of individual projects are often extended again and again, and numerous changes in investment plans in the course of the year and transfers of allocations are made from the point of view of maximum execution of the plans of outlays without regard to the real effects.

Contributing to this, among other things, are the still insufficient potential of the executing enterprises and the possibility of their choosing jobs more convenient for realization and offering opportunities for easier execution of valuable plans and thus increasing accumulation.

It is thus necessary to call attention to the mutual tolerance in enforcing the terms of agreement by means of conventional penalties, particularly as concerns punctual delivery

of planning and cost estimate documentation and the observance of the original dates agreed upon for completion of projects.

Besides the numerous examples of prolonged investments in the key industry; the widespread prolongation of realization of investments of the local plans is also noteworthy.

Examples of prolonged realization of investments of the local plan of Warsaw are the construction of the house of culture in Targowek, with a cost estimate value of 19.9 million zlotys, started in 1950 and continued after many postponements; the construction of the central automobile workshops, with a cost estimate value of 30.9 million zlotys, also started in 1960, etc.

The control of the health investments in Warsaw Wojewodztwo has shown that the total cost estimate value of investments in the course of realization was 313 million zlotys in 1958. This volume of annual outlays devoted to the realization of investments indicates an average construction cycle of 4.5 years, while according to the norms for the individual projects they should be completed in about one and one-half years.

For example, the expansion of the hospital in Zyrardow, with a cost estimate value of 41 million zlotys, in progress since 1950, was planned to be completed in 1959, but by 1958--that is, after nine years--only 20.2 million zlotys had been spent for this investment--less than 50 percent of the total value of the project. The case of the expansion of the sanatorium in Dziekanow is similar, dragging on since 1948.

The prolongation of the realization of investments is considerably influenced by the constant low execution of the planned annual real targets with relation to the utilization of the planned investment outlays. Out of the 256 beds planned to be completed by the Investment Administration of the Wojewodztwo Health Department in 1958, only 120 beds--that is, 47.7 percent--were actually ready for use.

An example of prolonged realization of communal investments in Warsaw Wojewodztwo is the construction of a sewer cleaning plant in Zyrardow with a cost estimate value of about 29 million zlotys, which has already been in progress for nine years and according to plan is to be continued until 1961.

In Katowice Wojewodztwo the construction of certain hospitals takes more than six years--for example, the hospitals in Czeladz, Zawiercie, and Czestochowa; in the investment plans for subsequent years the same period is assumed--for example, for the construction of the hospital in Sosnowiec, despite the fact that this is nearly twice as long as specified by the norm.

5. Investment Costs

The increase in investment costs in the course of their realization with relation to the previously assumed costs is almost a universal phenomenon, according to the NIK control.

Excessive increases in investment costs, apart from differences caused by price increases, occurs as a result of the previously discussed errors of programming and planning investments, excessive prolongation, poor organization and quality of execution, and re-invoicing of jobs.

Changes in the concepts of construction and design, often in the course of realization of investments, contributed heavily to widening the real range and become the cause of cost-increasing changes in designing documentation, execution of unnecessary jobs and deliveries, additional jobs, etc.

Connected with the improper preparation of investments for realization on the side of designing is also the problem of errors in planning investment outlays and, among other things, insufficient allocations for individual investments and dispersal of resources, which leads to prolongation of execution and is a source of further increases in costs.

The influence of the execution enterprises in the process of realization of investments, and their tendency to increase accumulations by inflating accounts, tolerated by investors because of lack of proper interest in costs and the ease of obtaining additional allocations, also favors unjustifiable cost increases.

Among other things, the failure to attach proper importance to the problem of costs results in routine treatment of cost estimate documentation, failure to bring up to date collective lists of costs of construction and detailed cost estimates

in the course of realization of investments lasting several years, and the settlement of accounts for investments on the basis of execution cost estimates.

To summarize, under such conditions the execution of real tasks keeps pace with the increases in investment outlays, and in individual cases the investment costs are a multiple of the originally planned costs.

The following are typical examples concerning investments of the local plans:

a) The investment costs of the construction of the Mlawa Factory for Children's Footwear (Mlawska Fabryka Obuwia Dziecinnego) increased from 5.5 million zlotys to 13 million zlotys (17.3 million zlotys in 1958 prices), with a simultaneous decrease in the production program from 640,000 pairs of shoes per year to 480,000 pairs. The increase in investment costs resulted from the widening of the intended range for administrative, social, and auxiliary production projects, reducing the usable area of directly productive projects.

b_ In Lodz the superstructure of the Radlinski hospital, in progress for years, which was to be completed at a cost of 780,000 zlotys, was completed only in the raw state by the end of 1958 and its cost, as a result of three changes in assumptions and errors in designing, increased to 3.5 million zlotys. Similarly, the costs of the continued construction of the children's hospital, which was to be completed in 1956, increased from 29 million zlotys to 50 million zlotys, and the cause of this was several changes in assumptions and revisions of documentation and jobs already executed.

c) The construction of the ski jump in Warsaw, the direct investor of which is the Committee for Physical Culture (Komitet Kurluty Fizycznej), has been in progress since 1955, and its originally estimated cost of 1.5 million zlotys will in fact increase to over 8 million zlotys. Such cases as deflation of the preliminary cost estimate to show an apparent cheapness of the investment; several changes in programming assumptions and in planning and cost estimate documentation; execution of unnecessary and useless jobs and installations; theft of materials, etc. all contributed to prolongation of work and increase in investment costs. The cost of technical documentation alone amounted to about 1,100,000 zlotys (and

this is not the final cost), and it will constitute about 15 percent of the investment outlays.

d) Excessive prolongation and increase in investment costs is evident in the construction of the Sports Park in Krynica. The construction was started in 1949 and was included in the investment plan in 1951. Investment outlays according to initial assumptions were fixed at 1.4 million zlotys. The completion of construction was planned for 1953, and then for 1956, and the investment is still unfinished. The collective list of construction costs computed in December 1958 gives a total of 18.5 million zlotys. This state of affairs was caused by execution of the investment without approved planning and cost estimate documentation (on the basis of waiver of the obligation to possess it) and considerable widening of the intended range of investment in the course of its realization. The execution and settlement of accounts for jobs and materials took place without cost estimates.

As we see, investment activity is characterized by numerous errors, only a small percentage of which are disclosed by controls, leading in specific cases to their elimination. If we think that, in spite of these numerous and widespread errors in the realization of investment plans, Poland is attaining considerable successes in industrialization, in the growth of housing and social construction, etc., we must remember that the elimination of at least a part of the discussed errors would release further huge reserves. Their utilization would contribute to a still faster economic development of the country.

Most certainly, alongside the discussed irregularities in investment activities, there are also positive examples; the only problem is that there should be as many more of them as possible and that a definite revolution should take place in this sector of economic activity, which still shows many shortcomings. A greater interest on the part of investors in the economic effectiveness of investment undertakings and the regular course of planning, financing, and realization of investments should contribute to this. A very important matter connected with this is strict observance of the investment rules in force. It is especially important not to start investments without complete and approved planning and cost estimate documentation and to observe the proper order of realization of multi-project investments and the norms of construction cycles approved by Resolution No 255/58 of the Council of Ministers.

A considerable improvement in increasing the effectiveness of investments should follow from a thorough revision of planning and cost estimate documentation ordered by Resolution No 174/59 of the Council of Minister of 12 May 1959 and the National Conference on the Problem of Effectiveness of Investments scheduled for December of this year.

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Development Problems of the Construction Materials Industry

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In considering the factors limiting the development of the national economy, it is generally accepted that the industries that create the foundations for economic development are the mining, power, chemistry, metallurgy, and machine-building industries. It seems that the construction materials industry should be added to this list.

For many years, in determining the level of investments, apart from difficulties emerging from the general proportions of the national economy and distribution of the national income, one of the limiting factors has been the volume of production of construction materials.

The construction materials industry, and particularly some of its branches, were not sufficiently appreciated and, in consequence, insufficient investments were made. The main cause of this was lack of proper study of the existing state of affairs in that industry. Against the background of the apparently simple and uncomplicated production of brick or lime work or open-pit exploitation of gravel, there was a conviction that, even in the case of exhaustion of the existing productive capacity, we would build the required number of brick or lime works, etc. without difficulty.

Also too optimistic were the decisions included in the Six-Year Plan, where, for example, the construction of scores of brick works was planned.

Unfortunately, in this item the plan was not supported by documentation or possibilities for the purchase of machines or, finally, a study of deposits of the raw materials. In effect, during the six years only two new brick works were

built--in Zielonka and in Zeslawice--whose bad reputation is well known. That industry was not properly modernized, equipment was not replaced, and large plants of the machine-building industry which could produce sufficient quantities of technically simple and universally used brick-making equipment were not created in the country. The only progress made was in the sector of drying works, which made it possible to eliminate, at least partially, the seasonal nature of work in brick plants.

The lime industry presents a very similar picture. Almost the entire investment effort so far has been directed to mechanization of processing of the raw material (which is undoubtedly the right direction), while investments in slaking lime were completely inadequate. As a result of such a policy, which was based on the conviction that there were in the lime industry numerous unutilized slaking aggregates, our industry now has extremely obsolete ring furnaces which are being eliminated throughout the world as uneconomical, labor-consuming in operation, and--worst of all--create difficult working conditions for workers. Throughout the 15 years we did not build a single modern lime plant, and in the existing plants not a single really modern and productive automatic furnace, of which many are being constructed throughout the world.

If under these conditions construction did, despite the constant shortcomings and material difficulties, realize its tasks, the cement industry contributed the most to this, being the only construction materials industry which has developed consistently and in a planned manner. Despite investment errors, often very serious and causing numerous disturbances in construction, in 1960 we will produce nearly 6.5 million tons of cement, while in 1950 the production was only 2.5 million tons and in 1955 3.8 million tons. We have started operations in several large new plants; we are constructing additional projects according to plan; and we have modernized old plants, though perhaps still insufficiently. Generally speaking, the Polish cement industry has reached the European level. In the period when the machine-building industry was not able to supply equipment for cement works, machines of well known European companies were imported; the next stage was plants equipped with imported installations with gradually increasing cooperation of domestic factories; and in the near future we are going to construct cement plants with machines produced wholly by the domestic industry.

The realization of the disadvantageous situation in the construction materials industry grew simultaneously with the material difficulties in construction and in consequence resulted in a big change, best illustrated by the volume of investments in that industry in the individual periods.

While in 1951-1955 about 5.5 billion zlotys (in 1958 prices) were spent on the construction materials industry, in all branches of the economy, in the plan for 1956-1960 the total outlays are estimated at about 13 billion zlotys, and the 1961-1965 Five-Year Plan provides for the expenditure of nearly 19 billion zlotys. The estimates quoted may contain some margin of error caused by price changes, but the tendency is obvious and the revolution which occurred in the 1956-1959 period testifies to a tendency toward final liquidation of shortages of construction materials.

However, increased credits mean a corresponding increase in investments in real terms, and for this the industry is not well prepared. It has turned out that there are serious shortcomings in geological documentation--which determines the location of industry, and the designing bureaus, with limited experience, are not able to provide the necessary documentation. The situation concerning the deliveries of machines and installations was not much better because domestic factories were not geared to a rapid increase in orders, and as for imports, the stumbling block was either the well-known foreign currency difficulties or lack of supply studies. Under these conditions, it was not always possible to conduct well planned investment activity supported by an economically justified choice of the best solution from among several alternatives. Plants which had the best chance of rapid realization were constructed, disregarding whether or not the effectiveness of their construction had been checked and documented. As in many other fields, studies of economic effectiveness of investments were in practice not pursued, and the justification of the desirability of the given investment was limited to simplified calculations contained in the economic part of the initial plans.

The basic problem to be solved is the choice of assortment of production in substitute materials. This applies particularly to substitutable wall materials, but the problem also exists in the field of binding, roofing, flooring, and finishing and other materials.

In the case of wall materials, apart from the traditional full ceramic bricks and hollow bricks, a new type recently appeared--the so-called grate brick, which has advantageous indices and undoubtedly good prospects for application. Lime and sand bricks, neglected for many years, have numerous advantages which predestine them for intensive development, mostly at the expense of construction ceramics. Undoubtedly a great future will be enjoyed by light-cell concretes; although they have inferior resistance and do not constitute construction material, their excellent thermal-insulating properties make them a first-rate and highly effective filling material. Gypsum has recently found a place in our construction. Gypsum blocks, factory produced, and gypsum boards prefabricated on the construction sites successfully compete with other wall materials. Finally, the whole rich range of slag hollows of various types is also distinguished by good economic indices and deserves attention.

As follows from the above, in order to effect a proper choice and ensure the most rational assortment structure, it is necessary to conduct a penetrating study backed not only by a knowledge of the needs and the resulting technical properties of individual materials but also by an analysis of investment and production costs of these materials.

A similar problem, though somewhat easier to solve, is the choice between cement, lime, and gypsum. Each of these materials has a different use and each is substitutable only within a limited range (plasters, certain binding mortars). But even this insignificant margin of joint application may give rise to doubts and recently has more and more often undermined the rate of increase in lime production.

Also requiring solution is the range of production of hydrated lime and of slaked lime in lumps, which have the same application, differing only in form and method of use. Though hydrated lime is more expensive to produce and requires additional investments and packaging in sacks, it eliminates the labor-consuming slaking on the construction site and is easier to use. Thus, an evaluation of economic effectiveness is not obvious in this case either and requires backing with proper calculations.

Until recently, little importance was attached to the problem of choosing the method of production, and first of all

offers of suppliers or necessarily superficial observation of the work of plants built abroad was used. Of course this could not ensure an objective evaluation, especially since the foreign suppliers, for understandable reasons, stressed the advantages of their own technical solutions without mentioning the disadvantages of the advertized installations. The acceptance of a proper and economical technological solution becomes of great importance. One example of this is the production of cement clinker by the wet or dry method; the latter, as is well known, requires a much lower fuel consumption, different machining, etc. Also in this case the choice of one of the alternative solutions cannot be made without a deeper analysis and supporting calculations.

Finally, the determination of the optimum size of newly constructed plants requires somewhat deeper studies than those made so far. It is not permissible--as is often done--to use intuition and to quote foreign experiences. It is necessary to take into account such elements as the expected radius of sales, distance of the plant from the sources of raw material and fuel, etc.

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In the light of the above discussed problems, what are the development assumptions of the construction materials industry for the future, and to what extent, if any, do they take into consideration the studies of economic effectiveness of investments?

The starting point for the preparation of the long-term plan of development of the cement industry was an estimate of the needs for that basic binding material. In evaluating the demand, the present consumption of cement in the individual branches of construction, both socialized and nonsocialized, was taken into account, as well as all the elements which would influence the structure of consumption of basic construction materials as a result of the industrialization of construction and technical progress. Also taken into account was the substitutability of cheaper materials, such as lime and gypsum, for cement, of course reserving the full quantity of cement for jobs requiring the use of that most universal material. The recommendations for the plan for 1961-1965 provide the production in 1965 of 10,250,000 tons of cement, which, with relation to the planned production in 1960, means

an increase of nearly 60 percent. Approximate estimates of needs for the forthcoming years show that in 1975 the cement industry should produce about 17 to 18 million tons of cement.

The efforts to improve the effectiveness of the intended investments include more penetrating studies than heretofore on the optimum size of cement plants, and the results of the analyses show that the most economic, from the investment and operational point of view, is a cement plant with an annual production of 800,000 to 1,000,000 tons of cement.

The final studies on the choice of the most economic method of production have not yet been completed, but it is known that if the raw material conditions permit it the new cement plants will work on a dry method.

A new element in the planning of plants for binding materials is the complex utilization of the raw material. Small fractions of limestone which cannot be used in the lime industry and are rejected because they would decrease the economic results of the plant can very well be utilized as a raw material for cement production. The plants in Nowiny will be such a lime-cement combine, and in subsequent years additional combines of this type will probably be constructed. Regardless of the utilization of natural raw material bases, the cement industry will be able to use for production reject raw materials of other industries, such as post-flotation rejects after processing sulfur ore, post-sodium rejects (Matwy-Janikowo), large furnace slag as input and as filler, etc.

The development program of lime production is still under discussion. The supporters of decreasing the volume of production of slaked lime assumed in the Five-Year Plan, without neglecting the quantities destined for nonconstruction purposes, quote the quantitative ratio of cement to lime abroad and point out that these ratios in our construction industry are not correct. The opponents of this view argue that a comparison of the indices of economic effectiveness of both these materials, which for obvious reasons (lower production costs, cheaper investments) speak in favor of lime for the jobs in which it can be used (mortars, plasters). It seems that the volume of lime production for 1965, set in the recommendations to the 1961-1965 plan at about 4 million tons, including about 2,300,000 tons for construction purposes, should remain unchanged. Corresponding estimates for 1975 show that the demand for lime in the entire national

economy will be about 7 million tons, of which about 4.5 million tons would go to construction.

An undoubtedly proper trend which will be implemented in the long-term plan is the increase in the share of hydrated lime in the total quantity of lime produced. It is expected that by 1965 the production of hydrated lime will amount to about 700,000 tons--that is, about 30 percent of the lime destined for construction, while the assumptions for 1975 suggest the production of a hydrate at a level of 1.7 to 1.8 million tons, which means that 40 percent of the total lime will be used in construction.

In the case of lime, technological problems present no basic difficulties. The majority of specialists agree that the most suitable slaking aggregate is the automatic furnace, which of course may have various design alternatives. There is also the unanimous opinion that the currently used primitive slaking installations equipped with maturing apparatuses should be replaced by modern hydrators operating in a closed cycle.

The scale of development of the gypsum industry gives rise to numerous doubts. Undoubtedly the rich and excellent deposits of gypsum--a raw material which is not at all common--predestine Poland for a leading role in slaked gypsum production. The occurrence of gypsum is very convenient, and the cost of slaking, in view of the small quantities of fuel needed is--or at least should be--low; finally, there are the advantages of gypsum as a construction material. All this points to the desirability of a wide development of the gypsum industry. As is well known, gypsum has wide applications: it is a binding material for mortars and plasters; it serves for stucco work and dry plasters; and wall blocks are made of gypsum and--on the construction site--boards are also made. Finally, gypsum (gips jastrowy) is used for flooring and underflooring made of plastic materials.

Despite these wide possibilities for the utilization of gypsum in construction, and despite the indubitable advantages of that material, until recently construction organizations were reluctant to order gypsum, first of all because of their lack of skill in using it. Recently, thanks to intensive propaganda, the situation has changed and the stream of orders ensures the sale of all the currently produced quantities of slaked gypsum and gypsum products. With this background, the intended expansion of gypsum production to

about 700,000 tons in 1965 and about 2 million tons in 1975 seems proper, although these quantities are very high and their consumption in construction may entail some difficulties.

The estimated of needs for wall materials were prepared by two methods: statistical indices (consumption per million zlotys of value of construction and assembly jobs) and real indices in the individual branches of construction. The demand defined in this way will necessitate the production in 1965 of about 9 billion wall units and about 16 to 17 billion in 1975. While in the case of binding materials their substitutability is limited to small quantities--which fact greatly facilitates decisions as to the structure of production of these materials--in the case of wall materials, particularly filling ones, the determination of the range of production is very difficult. For this reason, studies on the economic effectiveness of investments in the individual types of wall materials have progressed rather far. Analyses of effectiveness were made for the majority of available materials and, in order to obtain the widest possible comparability on the use of these materials, all calculations were made in terms of one square meter of wall with similar heat conducting properties and similar usefulness.

Although the analyses are probably not free of errors resulting from methodological premises or acceptance of not always exact assumptions, the results generally confirm the existence of a certain order determining the higher or lower effectiveness of the use of individual materials. Thus, it can be accurately determined that among the construction wall materials the least effective one is full ceramic brick and silicate brick is better. Hollow products are superior to solid ones, and here again ceramics give way to silicate products. Among the filling products, light-cell concrete is the best, but hollow gypsum blocks and slag blocks, particularly hollow ones, are almost as good. Even this superficial evaluation creates certain premises for determining the desirable commodity composition, although complete agreement on this point has not yet been reached.

Thus, for example, the recommendations to the plan for 1961-1965 assume that in 1965 about 4.5 billion wall units of red brick, including grate brick, will be produced, plus about one billion silicate bricks, while later proposals suggest an increase in the production of lime-sand bricks by about 100 million pieces and of wall elements based on cement by 200 million wall units, and the same time a decrease in

production of red brick by 300 million units. The production of gas-concretes is to amount to about 1,100 million wall units and that of gypsum elements to 180 million units. Blocks and hollows based on light aggregates will reach a production of about 2 billion wall units.

The preliminary assumptions for 1975 provide for taking into account the results of studies on the effectiveness of application of individual types of wall materials. Thus, the production of ceramic bricks will increase only symbolically to 5.0 or 5.5 billion units, while the production of silicate products will be doubled--to 2 billion units. Also doubled will be light-cell concretes and dust concretes, the production of which will also be about 2.5 billion units. Despite the indubitable advantages of gypsum products, they will constitute only a small part of the total of wall materials, although their production will almost treble and reach a level corresponding to about 0.5 billion wall units. It is expected that the same quantity will be obtained from stone elements, which will play an important part in local construction, mostly for foundation purposes. Finally, it is necessary to mention the very large quantity of blocks and hollows based on cement and light aggregates. This material too will be doubled in comparison with the 1965 assumptions, and in 1975 it is estimated that about 3.5 billion wall units will be obtained from this source.

Apart from the above-mentioned "factory"-produced materials, a constantly greater use in construction will be made for walls executed by the wet method on the construction site, on the basis of light aggregates. In 1965 walls constructed by this method will correspond to the quantity of 400 to 500 million wall units, and in 1975 to about one billion units.

The serious tasks faced by construction make it necessary to view the problems of aggregates in a slightly different way. In the past, the basic mass of aggregates consisted of natural gravel and sand, extracted and improved by industrial methods or exploited primitively by construction enterprises or their small suppliers.

The growing requirements in the production of concretes, aiming at lighter construction, and the demand for wall materials produced on the basis of light aggregates, makes it necessary to look for sources of superior and first of all lightweight aggregates.

The assumptions of the plan for 1965 provide for the production of about 24 million tons of natural aggregates, more than half of which is gravel, and in addition about 2 million tons or 3 million cubic meters of light aggregates.

The estimates for 1975 show the necessity of increasing by about 50 percent the natural aggregate base with a simultaneous doubling or perhaps even trebling of the production of light aggregates. Particularly important light aggregates are clay aggregate, the share of which in 1975 is to reach about 30 percent of the total quantity of light aggregates, and foamed gravel (also about 30 percent). The remaining aggregates will be produced of fissile coal and furnace slag.

The needs of construction for roofing materials was determined on the basis of assumptions concerning the area of roofs, divided into flat and steep roofs. Also taken into account was the postulate of timber economies, which decisively influences the type of material used. The basic material will still be tarpaper, which in 1965 and 1975 will be used to cover about 30 to 40 percent of the total area of newly constructed and repaired roofs.

The share of eternite will increase from about 18 million square meters to about 30 million square meters, for, as studies have shown, this material is the most effective. A condition for such an increase is the import of asbestos, and if this cannot be realized, the production of tarpaper will be correspondingly increased. The consumption of ceramic tiles remains at the same level in 1965 and 1975 (20 percent); the same is true of cement tile (about 14 to 15 percent). Among other materials, it is necessary to mention the so-called coverless plates and the use of metal plate--now insignificant--which will increase to about 15 percent in 1975.

Our construction [methods] consume little thermal insulation. The use of thermal insulation in housing construction makes it possible not only to decrease the thickness of walls and ceilings but also to save at least 30 percent on fuel. For example, it can be said that in order to attain the same temperature requirements for housing quarters, it is possible to use a plate of glass fiber 3 centimeter thick instead of a wall of ceramic brick 51 centimeters thick. In industrial construction, of greatest importance is insulation of thermal installations, such as pipelines, conductors, containers, etc. The importance of insulation here can also be illustrated by an example. The insulation of a pipeline 100

meters long with a circumference of 100 centimeters and an inside temperature of 300 degrees ensures the return of the cost of insulation after six months. Studies on the effectiveness of individual types of insulation--and there are many of them--were made only sporadically by comparing certain indices, such as capital absorption, fuel consumption, electric power consumption, and labor absorption. Even this analysis shows that the most economical materials are products of nonorganic origin, and among organic materials [the best are] "Styropor" and "Iporka." The following are the production estimates of basic insulation materials in the long-range plan. Mineral wool will be the basic material, and its production will be about 45,000 tons in 1965 and 85,000 tons in 1975. Glass fiber will increase, respectively, from about 12,000 tons to about 25,000 tons. The production of Iporka will increase from about 270 tons in 1965 to about 350 tons in 1975, and insulation materials made of plastics from 2,000 tons in 1965 to 4,000 tons in 1975.

Among the basic construction materials, it is also necessary to include glass. In general, everyone agrees that in our construction the use of glass is insufficient, and this results mostly from the accepted architectural solutions. We now see more and more glass surfaces in buildings, and this undoubtedly forecasts changes and a gradual increase in the use of glass as a more responsive material in construction. In order to satisfy the requirements of modern architecture, the recommendations for the Five-Year Plan provide for a considerable increase in window glass, from 26 million square meters in 1960 to 37 million square meters in 1960 [sic; presumably 1965]. Estimates for 1975 set the demand of the construction industry at 60 million square meters of window glass, not counting other types, such as rolled glass, polished glass for shop windows, construction forms, layer plates, etc.

The discussed construction materials do not constitute the full list of products and materials used in construction. We have intentionally neglected flooring materials, installation and finishing materials, iron, wood, etc. They all entail their own extensive problems. We have mentioned the basic materials of particular importance for construction--the development of which means the greatest investment effort--and the determination of rational trends in this development which still require many studies and discussions.

The target figures, particularly for 1975, still remain in the realm of analytical considerations and will undoubtedly be corrected and revised many times. If the present article leads to serious and well documented criticism of the presented developmental trends, it may contribute to an improvement in the economics of construction and to economies in our national economy.

POLAND

New Standards for Housing Construction

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The Council of Ministers (Rada Ministrow) of Poland approved on 20 August of this year, in Resolution No 364/59, new standards for housing construction. The standards apply to the designing of multi-family housing with two or more levels, built in towns and settlements, and financed either exclusively by the state or by other investors with financial state aid. On the basis of this resolution, the previous standards on which housing construction has been based since 1954--that is, for over five years--are abolished.

The new standards are the result of lengthy studies and are based on a lengthy collection of preparatory materials collected by the Institute of Housing Construction (Instytut Budownictwa Mieszkaniowego). The materials were the subject of numerous discussions, both within and outside of the Institute, and the draft standards prepared by the Institute based on them were evaluated, by means of a questionnaire, by the supervisory authorities--the Ministry of Communal Economy (Ministerstwo Gospodarki Komunalnej), the Ministry of Construction and Construction Materials Industry (Ministerstwo Budownictwa i Przemysłu Materiałowy Budowlanych), the Committee on the Affairs of Town Planning and Architecture (Komitet dla Spraw Urbanistyki i Architektury); the investors--the Administrations of the BOR [Budowa Osiedli Robotniczych; Workers' Settlements Construction] and the Association of Housing Cooperatives (Związek Spółdzielni Mieszkaniowych); and the designers--the SARP [Stowarzyszenie Architektów Rzeczypospolitej Polskiej; Association of Architects of the Polish Republic] and City Projects (Miastoprojekty). After the introduction of several additions and changes which the supervisory institutions found it necessary to introduce, the standards were given their final form, in which they were approved and published in Monitor Polski, No 81, of 30 September 1959.

The new standards are the next developmental stage of the standard rules on which our housing construction was based after the war. In chronological order, the rules were as follows:

1. Instructions of the Minister of Reconstruction (Minister Odbudowy) of 10 September 1947.

2. Draft standards prepared in 1950 and recommended for use by the CZ [Centralny Zarzad; Central Administration] of Designing Bureaus of Town Construction (Biur Projektowych Budownictwa Miejskiego) in a letter of 19 September 1951.

3. Standards for apartments and housing buildings in towns and settlements of urban type, approved by Resolution No 70/54 of the Presidium of the Government of 6 February 1954.

The present standards grew organically from those provisions and are related to them in that the basic idea of ensuring the population--within our economic possibilities--of modest but satisfactory and biologically adequate standards of space and equipment--standards which would take into account and reconcile the interests of an individual (sufficient space per person), family (separate, independent housing), and society (maximum housing units produced with the available financial resources, construction materials, and manpower).

The new standards endeavor to meet these difficult requirements:

- 1) by maintaining the basic space standards on the present modest but adequate level, amounting to about 11 square meters of usable area per person;

- 2) by dividing apartments into categories and a differentiation of their size into individual categories as far as possible, with the unconditional preservation of the principle that each family should have a separate apartment, to create apartments which will correspond to the size structure of families under the conditions of each architectural assembly constructed;

- 3) by introducing a measure of construction production that will facilitate the obtaining from the available material resources the largest possible number of housing units, taking into account the local conditions and needs.

It is necessary here to explain first of all the problem of usable area per person in apartments of various categories because this determines the average level accepted as the basis of the space standard (11 square meters per person). This problem today is still often misinterpreted by the general consumers and sometimes even by certain designers. The usable area per person differs in apartments of different sizes. Using extreme examples, let us consider apartments for one-person and seven-person households.

It is clear that in an apartment for a single person the space standard must be higher, for in the 11 square meters accepted as a total apartment space it is not possible to design a room in which the occupant would not feel cramped, particularly since this is his bedroom and living room at the same time. It is also impossible to squeeze into this space even a very small hall, lavatory and bathroom in which it would be possible to wash completely (with at least a shower); it is impossible to find space for storage of clothing, either in the form of a built-in closet or a space on which a wardrobe could stand. In addition, let us consider that a single person must have the possibility of preparing, if not all than at least some, meals and that there must be space for a gas or electric kitchen in a separate alcove or in a suitable enlarged hall. As a result, the housing space in this case must be 12 to 14 square meters and the auxiliary space (hall, bathroom with lavatory, kitchen, wardrobe) 5 to 6 square meters. Thus a single-person apartment will have a usable area of 17 to 20 square meters and therefore the space expenditure per person will be an average of 18.5 square meters.

Let us now consider the example of a seven-person apartment.

In such an apartment, auxiliary space will not increase sevenfold in relation to the auxiliary space of a single-person apartment. It will fit into much smaller limits of 17 to 22 square meters. It will consist of a kitchen of 5 to 9 square meters, a hall of 6 to 7 square meters, a bathroom of 3 square meters, a lavatory of about one square meter, and built-in closets of 1.5 to 2.0 square meters. If we consider that for the needs of a seven-member family a usable area of 48 to 50 square meters will suffice (for example, there can be three double bedrooms, about 9 square meters each; one single bedroom, about 6 square meters; and a children's room of about 15 to 17 square meters), it will

turn out that the total usable area of such an apartment will be about 67 to 71 square meters. It is easy to calculate that in this case the expenditure of usable area per person will be about 10 square meters, and despite this the family will have quite decent living conditions: at most two-person bedrooms, one single room for an elderly person in the family, for a student, or for temporary isolation of a sick member of the family. The auxiliary space will also contain all the elements indispensable for normal existence.

Of course, none of the examples given constitutes a recipe for planning an apartment. There may be many solutions for all the categories of apartments, because the standards leave much freedom to the designers. Thus, other combinations in number and size of rooms and auxiliary space are possible, provided that their proper functions are preserved. The standards do not prohibit the use of children's rooms through which entry has to be gained to other rooms, if this is a functionally justified or so-called single-space solution. The investor, on his part, may help the architect in designing the apartment by informing him on the family structure of the future users--that is, those who are to obtain the designed apartments.

Between the above examples there is a rather wide range of apartments of other categories, as shown in Table 1.

Table 1

Category of Apartment	Usable Area, Square Meters	Average Usable Area, Square Meters	Number of Persons	Expenditure of Usable Area per Person, in Square Meters
M 1	17 to 20	18.5	1	18.5
M 2	24 to 30	27.0	2	13.5
M 3	33 to 38	35.5	3	11.83
M 4	42 to 48	45.0	4	11.25
M 5	51 to 57	54.0	5	10.80
M 6	59 to 65	62.0	6	10.33
M 7	67 to 71	69.0	7	9.86

In these apartments, the lower the category of apartment (that is, the smaller the family) the higher is the space expenditure, and conversely. In apartments designed for families of average size, constituting--as demographic studies show--the most numerous group in the country, the level of the standard fluctuates around 11 square meters. The mutual

dependence of the size of the apartment and the expenditure of usable area per person is illustrated in Figure 1.

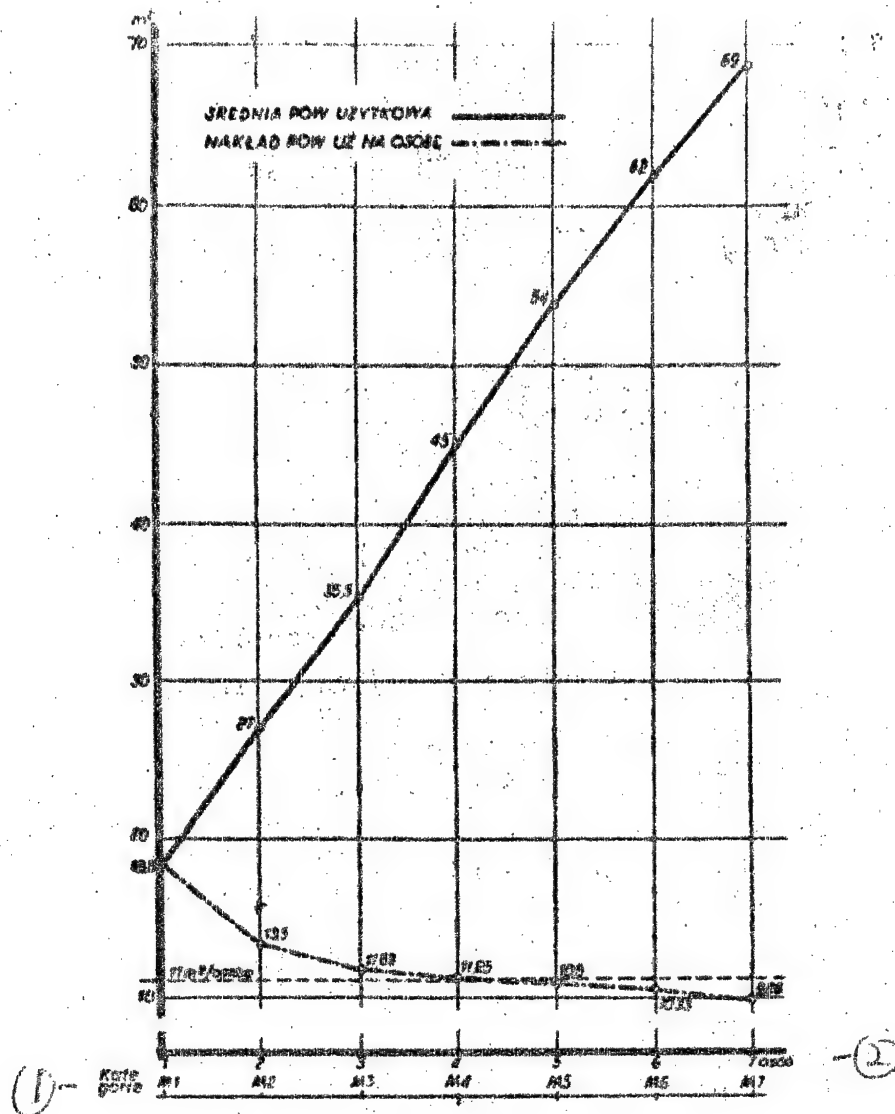


Figure 1

Interdependence of Usable Area of Apartment and Expenditure of Usable Area per Person

- usable area 1) category
- - - - - expenditure of usable area per person 2) number of persons

The proper quantitative effect, measured not in rooms but in apartments, and the creation of decent living conditions for a given number of families, is being ensured by the new standards through the introduction of a new measure and regulator of housing construction.

This regulator is the average size of apartment. It is the average meterage of usable area, which is calculated as a weighted average in a given assembly of planned apartments and should not exceed 44 square meters. The calculation of this index is obligatory in the programming and designing of construction of a housing block or assembly of a different size encompassed by one architectural plan of space management.

The size of the average in a group of apartments is influenced by two factors: the size of average apartments as accepted in designing and the number of apartments in each category--that is, the housing structure of the assembly. The size of apartments may be chosen by the designer within the limits outlined in the space table (see Table 1), while the apartment structure is dictated by the local conditions--that is, the size structure of households of the group of users who are to live in the planned assembly.

The first factor is rather flexible. In each category of apartments the designer can choose spaces differing from their upper and lower limits by 3 to 6 square meters. The structure, on the other hand is a much more rigid factor and independent of the designer, who cannot change the existing family situation. The magnitude of 44 square meters is chosen in such a way that--with a full structure containing all categories of apartments and a formation similar to the average structure of housing assemblies constructed in our towns, where apartments of the average categories (from M 3 to M 5) constitute 70 to 80 percent of the total and the remainder is divided more or less into equal parts between the smallest apartments (M 1 and M 2) and the largest apartments (M 6 and M 7), and with the proper use in all apartments of the average usable area for individual categories as given in Table 1--the value of the average weighted size of apartments in the entire assembly will not exceed 44 square meters.

A weighted average of 44 square meters corresponds approximately to the average usable area for category M 4; hence the conclusion that, if the assembly consisted exclusively of apartments of this category, the maintenance of the weighted

average at the level of 44 square meters would not present any special difficulties. If the assembly consisted only of smaller apartments (M 1, M 2, M 3), the weighted average would be less than 44 square meters, even if the designer utilized the maximum usable area in each of these categories, and thus it would satisfy the assumption. But if the assembly contained exclusively large apartments (M 5, M 6, M 7), the weighted average at 44 square meters could not of course be maintained, even if the apartments in these categories were planned at minimum space levels. This follows clearly from Table 1 given above.

Thus, the conditions of maintaining the required size of apartments are, on the one hand, a proper structure, more or less corresponding to the previously discussed average structure, and on the other hand the areas of the individual apartments corresponding to their standard limits.

But what should be done if in exceptional cases the housing structure in a planned architectural assembly will have to contain only large apartments? In such a case, the standards provide for an appeal to the Minister of Communal Economy, who, with the agreement of the proper investor, may, for the given architectural assembly, give a different value to the weighted average.

It must also be observed that the space table of the new standards is so constructed that the lower limits of the usable area of individual categories always give the possibility of designing an apartment for the number of persons provided for in this category. In this realism of the lower limits, the new standards constitute an improvement on the previous standards. These limits were checked from this point of view in test designing; their design usefulness has also been confirmed in the results of SARP competitions No 230 and 231 of 1957. The conditions of these competitions freed the designers from the obligation to adhere to the space table of the standards of that time; they only imposed the condition of obtaining an average of 11 square meters of usable area per person. Thus, as a result, every designer could himself choose the size of the usable area of the apartment which he considered most proper for a family of the given size. The limits of usable area of competition apartments obtained through an analysis of these apartments

obtained through an analysis of these apartments and compared with the standard limits are presented in Figure 2, which shows their considerable similarity.

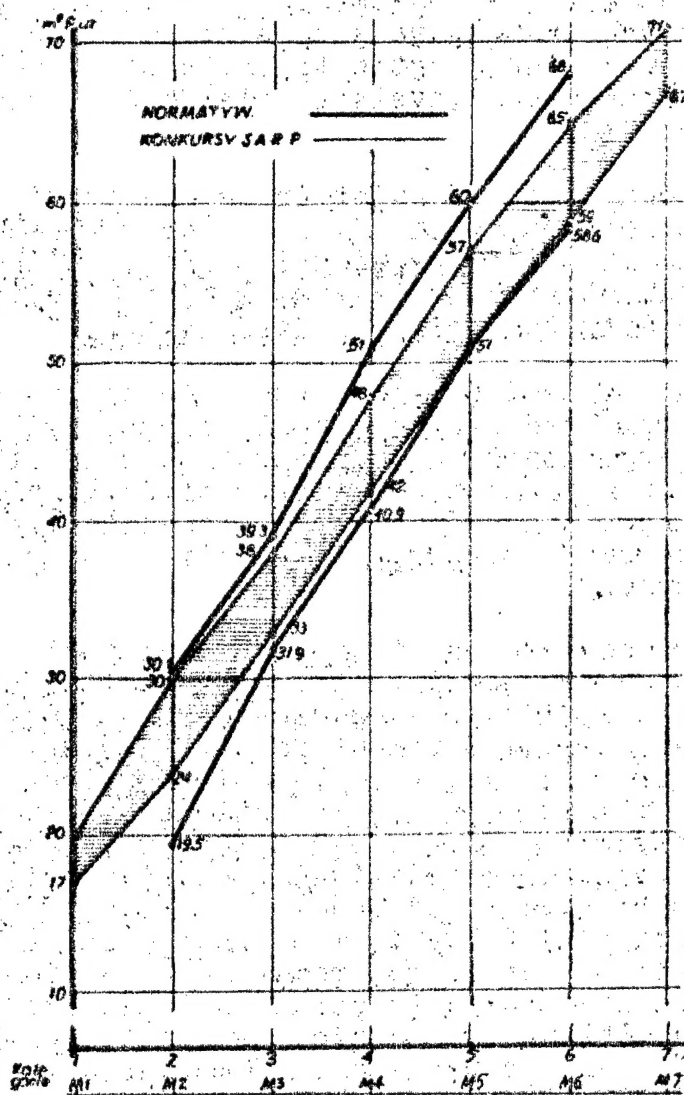


Figure 2

Comparison of the Minimum and Maximum Usable Area of Apartments Accepted in the Standards and in SARP Competitions

— standards
 - - - SARP competitions

In characterizing in general the new standards of designing, it is possible to state that, despite the preservation of the same standard basis on which the previous rules were based, they constitute an important step forward in our housing construction. They give a much more elastic tool to the designers, leave the door open for invention, ensure them of much freedom in choosing the set-up of apartments and in shaping interiors. They free investors from the duty of using rigid housing structures fixed in the previous standards and open the way for them to choose whatever structure for the planned investment best corresponds to the existing needs.

But at the same time it gives to both [designers and investors] greater responsibility toward the society to improve housing conditions in the exploitation of these facilities.

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